



The seventh edition of the *Nouvelle Flore de la Belgique*: nomenclatural and taxonomic remarks

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Illustrations: map (Fig. 1) by Wesley Tack and Sven Bellanger.

ABSTRACT. – Following the publication of the seventh edition of the *Nouvelle Flore*, in 2023, this contribution provides an overview of nomenclatural and taxonomic changes compared to the previous edition of the Flora, which was published in 2012.

RÉSUMÉ. – La septième édition de la *Nouvelle Flore de la Belgique* : mises au point nomenclaturales et taxonomiques. A l'occasion de la publication de la septième édition de la *Nouvelle Flore*, en 2023, cette contribution donne un aperçu des mises au point nomenclaturales et taxonomiques vis-à-vis de l'édition précédente de la Flore, qui était publiée en 2012.

SAMENVATTING. – De zevende editie van de *Nouvelle Flore de la Belgique*: nomenclatorische en taxonomische commentaren. Naar aanleiding van de publicatie van de zevende editie van de *Nouvelle Flore*, in 2023, biedt deze bijdrage een overzicht van nomenclatorische en taxonomische wijzingen ten opzichte van de vorige editie van de Flora, die dateert van 2012.

Introduction

To continue a long tradition, nomenclatural and taxonomic modifications introduced in the latest edition of the *Nouvelle Flore* (Verloove & Van Rossum 2023a) are presented in this paper. Even more so than in previous editions, this paper should be regarded as an indispensable companion or supplement to the Flora. Due to a lack of space in the *Nouvelle Flore*, this paper contains a wealth of information that could not be included in the Flora itself.¹

The seventh edition of the *Nouvelle Flore* is the most radically modified edition since the origin of this Flora. Not only the format, concept and lay-out have considerably changed. The classification of families now is in line with molecular phylogenetic studies (for an overview of changed familial circumscriptions, see Van Rossum 2019). Also at lower taxonomic levels (genera, species complexes, etc.), modern insights were usually followed and, as a result, many generic concepts have changed.

All author citations were checked and many of them were corrected (as a rule, however, no reference is made to these corrections in this paper).

Finally, the publication of the Shenzhen Code in 2018 (International Code of Nomenclature for algae, fungi, and plants; available online at: <http://www.iapt-taxon.org/icbn/main.htm>) resolved several nomenclatural matters.

¹ This also applies to an identical edition in Dutch of the Flora (Verloove & Van Rossum 2023b) published shortly before the French edition.

Abbreviations

The following abbreviations referring to phytogeographical districts (Fig. 1) are frequently used throughout the paper:

- Ard. (district ardennais): Ardenne district.
- Boul. (district boulonnais): Boulogne district.
- Brab. (district brabançon): Brabant district.
- Camp. (district campinien): Campine district.
- Champ. (district champenois): Champagne district.
- Eifel centr. (district de l'Eifel central): central Eifel district.
- Fl. (district flandrien): Flemish district.
- Fluv. (sous-district fluviale): fluviale district.
- Lorr. (district lorrain): Lorraine district.
- Mar. (district maritime): maritime district.
- Mosan (district mosan): Maas/Meuse district.
- Pic. (district picard): Picard district.
- Tert. Par. (district du nord-est de l'Île-de-France): Paris Basin district.

Further frequently used abbreviations include:

- FG: *Flora Gallica* (Tison & de Foucault 2014).
- FT: *Flora der Region Trier* (Hand *et al.* 2016).
- FZ: *Flora Zeelandica* (Meininger 2018).
- H24: the 24th edition of *Heukels' Flora van Nederland* (Duistermaat 2020).
- AFL: *Atlas Flore Lorraine* (FLORAINE 2013; also checked online, but no longer available since mid-2021).
- NF6: the sixth edition of the *Nouvelle Flore* (Lambinon & Verloove 2012).



Figure 1. Delimitation of the territory covered by the Nouvelle Flore/Flora van België and the boundaries of the phytogeographical districts. Aa: Aachen; An: Antwerp; Br: Breda; Bo: Boulogne-sur-Mer; Bx: Brussels; Ca: Calais; Ch: Charleroi; Du: Dunkerque; Ei: Eindhoven; Ge: Ghent; Ha: Hasselt; Ko: Kortrijk; Li: Liège; Lu: Luxembourg; Ma: Maastricht; Me: Metz; Na: Nancy; Pé: Péronne; Re: Reims; So: Soissons; SQ: Saint-Quentin; Tr: Troyes; Vo: Vouziers.

- NF7: the seventh edition of the *Nouvelle Flore* (Verloove & Van Rossum 2023a).
- POWO: Plants of the World Online (<https://powo.science.kew.org/>).
- SI-Flore: database that merges data from the several different Conservatoire botanique national, thus presenting distribution maps for the entire French territory (temporarily unavailable online from mid-2021 onwards).
- wn.be: waarnemingen.be (<https://waarnemingen.be/>).

Results

General remark. – The following taxa are newly introduced in the Flora; they are now keyed-out and a full account is

presented (in alphabetical order; taxa from the completely revised genera *Rosa*, *Rubus* and *Salix* excepted):

Acer rufinerve Siebold et Zucc.

Alchemilla mollis (Buser) Rothm.

Anisantha madritensis (L.) Nevski

Artemisia princeps Pamp.

Avena barbata Pott ex Link

Bolboschoenus planiculmis (F. Schmidt) T. Egorova

Bolboschoenus yagara (Ohwi) Yung C. Yang et M. Zhan

Brachypodium phoenicoides (L.) Roem. et Schult.

Bromus commutatus Schrad. subsp. *decipiens* (Bomble et H. Scholz) H. Scholz

Callitriche truncata Guss. subsp. *truncata*
Campanula poscharskyana Degen
Cardamine occulta Hornem.
Carex pendula Huds. subsp. *agastachys* (L. f.) Ljungstrand
Centaurea nigrescens Willd.
Centranthus calcitrapae (L.) Dufur.
Cotoneaster dammeri C.K. Schneider
Cotoneaster dielsianus Pritzl
Cotoneaster divaricatus Rehd. et E. Wilson
Cotoneaster fangianus T.T. Yu
Cotoneaster franchetii Bois
Cotoneaster hjelmqvistii Flinck et B. Hylmö
Cotoneaster rehderi Pojark.
Cotoneaster salicifolius Franch.
Cotoneaster simonsii Baker
Cotoneaster sternianus (Turrill) Boom
Cotoneaster × *suecicus* G. Klotz
Cotoneaster villosulus (Rehd. et E. Wilson) Flinck et B. Hylmö
Cotoneaster × *watereri* Exell
Cotula australis (Spreng.) Hook. f.
Cytisus lotoides Pourr.
Dipsacus laciniatus L.
Dipsacus strigosus Willd. ex Roem. et Schult.
Echinochloa muricata (Beauv.) Fernald var. *wiegandii* (Fassett) Mohlenbr.
Elaeagnus angustifolia L.
Elaeagnus umbellata Thunb.
Eleocharis engelmannii Steud.
Epilobium brachycarpum C. Presl
Festuca trichophylla (Ducros ex Gaudin) K. Richt.
Galeopsis pubescens Besser
Galium murale (L.) All.
Geum macrophyllum Willd.
Himantoglossum robertianum (Loisel.) P. Delforge
Hordeum murinum L. subsp. *leporinum* (Link) Arcang.
Ilex crenata Thunb.
Inula racemosa Hook. f.
Juncus ensifolius Wikstr.
Juncus tenuis Willd. subsp. *dichotomus* (Elliott) Verloove et Lambinon
Linaria simplex (Willd.) DC.
Lonicera japonica Thunb.
Lonicera nitida Wils.
Lonicera pileata Oliv.
Oenothera oehlkersii Kappus ex Rostański
Oenothera rubricaulis Kleb.
Oxalis debilis Kunth
Oxalis dillenii Jacq.
Panicum barbipulvinatum Nash
Paulownia tomentosa (Thunb.) Steud.
Petasites japonicus (Sieb. et Zucc.) Maxim.
Poa infirma Kunth
Polypogon maritimus Willd.

Prunus laurocerasus L.
Raphanus raphanistrum L. subsp. *landra* (Moretti ex DC.) Bonnier et Layens
Rostraria cristata (L.) Tzvelev
Scirpus cyperinus (L.) Kunth
Sedum sarmentosum Bunge
Silene coronaria (L.) Clairv.
Sisymbrium irio L.
Smyrniolum perfoliatum L.
Solanum sarachoides Sendtn.
Soliva sessilis Ruiz et Pav.
Sporobolus indicus (L.) R. Brown
Taraxacum argutum Dahlst.
Typha laxmannii Lepechin
Ulex minor Roth
Verbena bonariensis L.
Veronica cymbalaria Bodard
Viola tricolor L. subsp. *saxatilis* (F.W. Schmidt) Arcang.
Wolffia columbiana H. Karst.

Many additional species could have been added, especially ephemeral or only locally naturalized aliens. Detailed information about numerous species, including identification keys, is available on <https://alienplantsbelgium.myspecies.info/>.

Remark on the presentation of the comments below. – The species are discussed in the order as they are treated in the Flora; the numbering of the families follows the Flora. When several notes on a genus are given (usually including comments on more than one species) the first occurrence of the genus name in the text is in **bold**.

1. Lycopodiaceae

- The genera *Diphasiastrum* Holub and *Lycopodium* L. were merged, since molecular data have demonstrated that the former is best accepted as a section of the latter (Wikström & Kenrick 2001; see also FG). Alternatively, *Lycopodium* could have been further segregated, also recognizing *Spinulum* A. Haines to accommodate *L. annotinum* L. (as was done in H24, based on Pteridophyte Phylogeny Group 2016).

4. Equisetaceae

- An additional hybrid *Equisetum* L. has been reported from the Flora area, *E. ramosissimum* Desf. × *variegatum* Schleich. ex F. Weber et D. Mohr [*E. ×meridionale* (Milde) Chiov.]. It was discovered in 2019, along with both parents and *E. ×moorei* Newman (*E. hyemale* L. × *ramosissimum*), in the Braakman in Zeeland, the Netherlands (de Winter & De Somer 2021).

A very useful key for the identification of hybrids from subgenus *Hippochaete* (Milde) Baker was published by Jepson *et al.* (2013).

- *E. hyemale* L. subsp. *affine* (Engelm.) Calder et R.L. Taylor: non-native plants are ascribed to this taxon from North America (that probably also includes some plants from eastern Asia). According to some authors this is best

accepted as a distinct species, *E. praealtum* Raf. (Christenhusz *et al.* 2019). This name was added, as a synonym.

7. Hymenophyllaceae

- *Vandenboschia speciosa* (Willd.) Kunkel: this species was treated as *Hymenophyllum speciosum* Willd. in NF6. Molecular studies have demonstrated that it belongs in a separate genus, *Vandenboschia* Copel. (Ebihara *et al.* 2006).

10. Pteridaceae

- An additional alien species of *Pteris* L., *P. vittata* L., was recently observed as an escape from cultivation (Liège, 2015; wn.be).

- An additional alien species of *Adiantum* L., *A. aleuticum* (Rupr.) C.A. Paris, has been observed as an escape on a brick wall in Bruges (Assebroek) since 2016 (wn.be).

13. Aspleniaceae

- *Ceterach officinarum* Willd. was transferred again to *Asplenium* L., the genus in which it was originally described (as *A. ceterach* L.).

- *A. trichomanes* L.: a useful article about *A. trichomanes* hybrids and their recognition in the Flora area, particularly in the Ardennes, was published by Bizot (2011).

- *A. ×alternifolium* Wulfen (*A. septentrionale* × *trichomanes*): two nothosubspecies of this hybrid have been recorded in the Flora area. In addition to nsubsp. *alternifolium*, a hybrid with *A. trichomanes* subsp. *trichomanes*, nsubsp. *heufferli* (Reichardt) Aizpuru, Catalán & Salvo, a hybrid with *A. trichomanes* subsp. *pachyrachis* (Christ) Lovis et Reichst., was discovered near Aywaille in Mosan (Gyselinck *et al.* 2021).

16. Athyriaceae

- Sometimes cultivated as an ornamental and very rarely subsontaneous: *Anisocampium niponicum* (Mett.) Y.C. Liu, W.L. Chiou & M. Kato [syn.: *Athyrium niponicum* (Mett.) Hance]; it was recorded in As in 2017 (wn.be).

18. Dryopteridaceae

- *Polystichum* Roth: the two native species with 2 or 3-pinnate leaves, *P. aculeatum* (L.) Roth and *P. setiferum* (Forssk.) T. Moore ex Woynar, as well as their hybrid, *P. ×bicknellii* (Christ) Hahne, are not always easily identified. These three taxa are very variable, which sometimes leads to the impossibility, based on morphological criteria, of identifying the taxon to which certain individuals relate. The measurement of the average length of their stomata makes it possible to differentiate these taxa: they are ~ 42, ~ 54 and ~ 49 µm for *P. setiferum*, *P. aculeatum* and *P. ×bicknellii* respectively (Bizot *et al.* 2015).

- Three additional alien species of *Polystichum* have been recorded as casual escapes from cultivation: *P. acrostichoides* (Michx.) Schott (Heks, 2019), *P. munitum* (Kaulfuss) C. Presl (Kontich, since 2019) and *P. polyblepharum* (Roem. ex Kunze) C. Presl (scattered records since 2014) (wn.be).

- Hybrids between *Dryopteris affinis* (Lowe) Fraser-Jenkins and *D. filix-mas* (L.) Schott were already known in the Flora area. However, the exact identity of these hybrids remains to be determined, depending on the subspecies of the former involved. Next to *D. ×complexa* Fraser-Jenkins nsubsp. *complexa* (*D. affinis* subsp. *affinis* × *filix-mas*; tetraploid), already known, also *D. ×complexa* nsubsp. *critica* (Fraser-Jenkins) Fraser-Jenkins [*D. affinis* subsp. *borreri* (Newman) Fraser-Jenkins × *filix-mas*; pentaploid] has been recorded in Camp., Brab. or. (the Netherlands) and Ard. (France) (Bizot 2010, Hovenkamp *et al.* 2018). In Anchamps, in French Ard., both nothosubspecies occur as confirmed by flow cytometry (Bizot l.c.).

- An additional alien species of *Dryopteris* Adans., *D. erythrosora* (D.C. Eaton) Kuntze, has been recorded as an ephemeral or more or less persisting escape from cultivation. It has been known from several localities in Fl., Camp. and Brab., the first in Bruges in 2015 (wn.be).

- *D. affinis* (Lowe) Fraser-Jenkins: assessing the identity of the subspecies of this species in the Flora area requires further study. To further complicate the issue, a fifth taxon from this complex was recently described from Germany, *D. lacunosa* S. Jess. *et al.* (Jessen *et al.* 2011, FT) and it has been recorded near to the eastern border of the Flora region, in the Moselle valley in Tawern (Germany). According to Jessen *et al.* l.c. it is a genetically distinct triploid that mostly looks like subsp. *borreri*. In fact, it is merely a lobed-pinnuled and toothed form of the triploid subsp. *borreri*, whose type is a small specimen of the same entity, with brown scales, and brown colouring marks on the stipe and acute teeth; however, being a small specimen, the pinnules are unlobed. Jessen *et al.* (2011) justified their new species (anyway at a much too elevated taxonomic rank) based on biochemical features but these were subsequently invalidated (Fraser-Jenkins *et al.* 2020). Thus, *D. lacunosa* was merely added as a synonym of subsp. *borreri*.

19. Polypodiaceae

- *Polypodium cambricum* L.: this Mediterranean-Atlantic species has been known from old brick quay walls in Bruges since at least 2012 (wn.be; identity confirmed by flow cytometry). Its nearest native populations are in the British Isles. The leaves of this species are barely twice as long as they are wide, and at least some of the spores have paraphyses (branching, multicellular 'hairs'). Its status with us is unknown (subsontaneous or natural range extension?). Perhaps it is overlooked and should be looked for elsewhere.

22. Pinaceae

- An additional species of *Abies* Mill., *A. homolepis* Siebold et Zucc., has been recorded to self-sow (Ravels, 2019; wn.be).

24. Cupressaceae

- *Chamaecyparis nootkatensis* (D. Don) Spach is now ac-

cepted as *Cupressus nootkatensis* D. Don. This species has rarely been observed as an escape from cultivation. For the same reason, the (cultivated) intergeneric hybrid \times *Cupressocyparis leylandii* (A.B. Jackson et Dallim.) Dallim. (*Cupressus macrocarpa* Hartw. ex Gord. \times *nootkatensis*) is now called *C. \times leylandii* A.B. Jackson et Dallim.

25. Taxaceae

- The exact identity of *Taxus* plants observed these days as escapes from cultivation, or locally even as naturalized populations, is uncertain. Several species, as well as hybrids, are cultivated and probably dispersed by birds. However, their identification is not easy. In addition to *T. fastigiata* Lindl. (already mentioned in NF6), one should look for *T. recurvata* Lawson, *T. canadensis* Marshall, *T. cuspidata* Siebold et Zucc. (Spjut 2007a, 2007b, FG) and perhaps especially the hybrid between the latter and *T. baccata*, *T. \times media* Rehd. (Stöhr 2019). This issue requires further study.

27. Nymphaeaceae

- *Nymphaea alba* L.: the taxonomy of this species complex remains controversial. In NF6 *N. candida* C. Presl was reduced to subspecies rank under *N. alba*, following recent insights as explained in Verloove & Lambinon (2014). At present, most recent authors accept these two taxa again as distinct species (e.g. FG, H24). Apparently, *N. candida* is an allopolyploid hybrid of *N. alba* \times *tetragona* Georgi parentage (Volkova et al. 2010). According to Zonneveld (2019), based on genome size measurements, backcrosses with *N. alba* occur (*N. \times borealis*'), further complicating the distinction of taxa in this species group. Subsp. *occidentalis* (Ostenf.) Hyl. of NF6, with smaller, semi-closed petals, is merely ignored by recent authors (e.g. FG) and indeed probably of lesser taxonomic value (see, however, Stace 2019). In the absence of solid new evidence, the taxonomy followed in NF6 is maintained but new studies are obviously needed.

28. Saururaceae

- An additional alien species from this family, *Houttuynia cordata* Thunb., is sometimes recorded as an escape from cultivation (wn.be). This species is not only grown as an ornamental but also, by Asian immigrants, for its edible rhizomes (Saintenoy-Simon 2013).

34. Araceae

- Some additional alien species of Araceae have been recorded lately as, usually ephemeral, escapes from cultivation: *Zantedeschia aethiopica* (L.) Spreng. (rather regularly observed since 2013 and sometimes more or less persisting) and *Z. albomaculata* (Hook.) Baill. (Balén, 2011) (wn.be). *Typhonium venosum* (Ait.) Hett. et Boyce, already mentioned in NF6, is now treated as *Sauromatum venosum* (Ait.) Kunth, the name under which it is currently accepted.

- *Arum italicum* Mill.: the infraspecific variability of this species is differently treated in various recent Floras. Stace (2019), like NF6, accepted two subspecies whereas FG and H24 did not accept any infraspecific taxa. The two subspecies are indeed not always easily separated and their rank reduced to that of varieties, var. *italicum* and var. *neglectum* F. Townsend.

- An additional, alien species of *Wolffia* Hork. ex Schleid. has been recorded in the Flora area (in Camp. and Brab.), *W. columbiana* H. Karst. (Hendrickx & Verloove 2019, Lecron et al. 2021). It has pale green, somewhat translucent fronds with 1-15 stomata and the greatest width of the fronds is located well below the water surface. In *W. arrhiza* (L.) Hork. ex Wimm., in turn, the number of stomata is higher (usually 15-100), the fronds are dark green, not translucent and with their greatest width just below the water surface. This American species is in strong expansion (or has been overlooked for some time?) in the Netherlands and should be looked for elsewhere in the Flora area. It was added to the key and a full account was presented.

- *Lemna aequinoctialis* Welw. is very rarely encountered as a weed in garden centers and nurseries (Hoste 2011). It is characterized by its elliptical fronds with three distinct veins and its root with a winged triangular base.

- *Landoltia punctata* (G. Mey.) Les & D.J. Crawford [syn.: *Spirodela punctata* (G. Mey.) C.H. Thoms.] is very rarely observed as a weed in garden centers and nurseries (Hoste 2011). Like *S. polyrhiza* (L.) Schleid. it has several fasciculate roots but it is characterized by more elongated fronds (1,5-2 times longer than wide) with purple-red margins (top view).

35. Alismataceae

- *Baldellia ranunculoides* (L.) Parl.: two subspecies recognized in NF6 (subsp. *ranunculoides* and subsp. *cavanillesii* Molina Abril, Galán de Mera, Pizarro et Sardinero) are now accepted as two distinct species: *B. ranunculoides* s.str. and *B. repens* (Lam.) Ooststr. ex Lawalrée subsp. *cavanillesii* (Molina Abril, Galán de Mera, Pizarro et Sardinero) Talavera, following FG. Other recent flora accounts, e.g. H24, did not follow this taxonomic point of view because of the ease with which these two species hybridize.

37. Hydrocharitaceae

- An additional alien species from this family was recently recorded as a casual alien: *Limnobium laevigatum* (Humb. et Bonpl. ex Willd.) Heine (Ganshoren, 2013; wn.be).

- Some species of *Vallisneria* L. are sometimes cultivated in water bodies and especially in aquariums. A population of *V. australis* S.W.L. Jacobs & Les (syn.: *V. americana* auct. non Michaux) persists in a canal in Geel since 2016 (wn.be). These plants differ from *V. spiralis* in their leaves up to 35 mm in width (Mesterházy et al. 2021).

- *Najas marina* L.: Bräuchler (2015) typified names from the *N. marina* species complex. As a consequence, the correct name for the taxon previously known as *N. marina* s.str. (subsp. *marina*) is *N. major* All. The name *N. marina* L. should be reserved for the taxon previously known as *N. intermedia* Wolfg. ex Gorski [syn.: *N. marina* subsp. *intermedia* (Wolfg. ex Gorski) Casper].

42. Potamogetonaceae

- Some additional hybrids in *Potamogeton* L. have been recorded recently. *P. crispus* L. × *lucens* L. (*P. ×cadburyae* Dandy et G. Taylor) was recorded once in Mar. (polders) in 2012, along with both parent species (wn.be) and *P. crispus* × *perfoliatus* L. [*P. ×cooperi* (Fryer) Fryer] was observed with both parents on the Belgian side of river Maas (Fluv.) in 2015 (ID confirmed by A. Mesterházy; wn.be). In Champ., at Lac du Temple near Troyes, at the southern limit of the Flora area, *P. crispus* × *trichoides* Cham. et Schlecht. (*P. ×bennettii* Fryer) was recorded in several localities (Le Gloanec *et al.* 2019). Finally, in the Dutch part of Fluv. two more hybrids have been recorded lately: *P. gramineus* L. × *natans* L. (*P. ×sparganiiifolius* Laest. ex Fries) (H24) and *P. gramineus* × *perfoliatus* (*P. ×nitens* Weber) (Pot & Bruinsma 2019).
- *Potamogeton pectinatus* L. was transferred to the segregate genus *Stuckenia* Börner, as *S. pectinata* (L.) Börner, based on molecular studies (e.g. Lindqvist *et al.* 2006).

43. Ruppiaceae

- *Ruppia cirrhosa* (Petagna) Grande: this binomial was recently lectotypified and this name was shown to be a homotypic synonym of *R. maritima* L. Consequently, the name *R. spiralis* L. ex Dum. has nomenclatural priority over *R. cirrhosa* for the long- and coiled-pedunculate *Ruppia* (Ito *et al.* 2017).

45. Dioscoreaceae

- The genus *Tamus* L. is now included in *Dioscorea* L., since it is nested in it in molecular phylogenetic analyses (Caddick *et al.* 2002). The native species *Tamus communis* L. is now called *Dioscorea communis* (L.) Caddick et Wilkin.

47. Colchicaceae

- An alien species of *Colchicum* L., *C. byzantinum* Ker Gawl., is cultivated as an ornamental and has been recorded as an escape since 2013 (wn.be). In this species the flowers are more numerous (5-20) and the leaves are wider (5-13 cm).

49. Liliaceae

- Several taxa of *Lilium* L. are grown as ornamentals and some are occasionally observed as escapes, incl. *L. ×hollandicum* Bergmans ex Woodcock et Stearn, a hybrid not yet mentioned in NF6 (wn.be).

50. Orchidaceae

- General remark about the taxonomy of Orchidaceae.

As a result of molecular phylogenetic studies, the generic boundaries within this family have dramatically changed in the past 20 years. Some preliminary changes were already applied in NF6 and many more were made in this newest edition. These roughly agree with the taxonomy applied in FG. In recent years, yet other investigations have further explored the generic limits of certain genera. Tyteca *et al.* (2012), for instance, have advocated the segregation of the genus *Orchis* L., recognizing split-off genera such as *Herorchis* Tyteca et E. Klein, *Anteriorchis* E. Klein et Strack, *Paludorchis* P. Delforge and *Vermeulenia* Á. Löve (see also Tyteca & Klein 2008, 2009). These taxonomic changes, adopted by e.g. Kreutz (2019), were not yet taken into account.

The latter author has recently published a comprehensive, state-of-the-art publication on Orchidaceae in the Flora area (Kreutz 2019). He recognized rather numerous infraspecific taxa, many of them poorly known, and he reported some recently described taxa as well. However, the taxonomic value of many of these taxa requires further study, preferably applying molecular techniques. In most cases, no or little attention was paid to these taxa in NF7, although some may turn out to deserve taxonomic recognition. All cases relevant to the Flora area are referred to hereunder.

- The southern European species *Serapias vomeracea* (N.L. Burman) Briquet was mentioned by Kreutz (2019) from a locality in Belgian Mosan (Stockay). A single individual was found between 2012 and 2014 on the verge of a quarry. However, since there was some doubt about this identity and the fact that the species may have been deliberately introduced, this species was not included in NF.

- An additional intergeneric hybrid has been recorded: *Dactylorhiza maculata* (L.) Soó × *Gymnadenia conopsea* (L.) R. Brown [*Dactylodenia legrandiana* (E.G. Camus) Peitz]. This very rare hybrid is known from the Belgian part of the Sint-Pietersberg (Kreutz 2019).

- Two additional hybrids in *Epipactis* Zinn were discovered in the Flora area. *E. helleborine* (L.) Crantz × *leptochila* (Godf.) Godf., *E. ×stephensonii* Godf., is readily produced wherever both parent species grow in close proximity (Mariamé & Delforge 2013 and references therein; also Kreutz 2019). It has been demonstrated on several occasions that plants found in our area, for instance in Mosan, rarely refer to pure *E. leptochila* (neither subsp. *leptochila* nor *neglecta* Kümpel) but rather to this hybrid (Delforge & Breuer 2015, Delforge *et al.* 2015). Kreutz (2019) further mentioned a hybrid of *E. leptochila* subsp. *neglecta* [as *E. neglecta* (Kümpel) Kümpel] × *helleborine* from Belvaux (Bois de Resteigne). A second hybrid, *E. helleborine* × *muelleri* Godf. (*E. ×reinekei* P. Bayer), is known from Wijlre Akkers in Zuid-Limburg, the Netherlands (Brab. or.) (Kreutz 2019).

- *E. helleborine* (L.) Crantz var. *orbicularis* (K. Richt.) Aschers. et Graebn.: in NF6, this taxon was said to occur sporadically throughout most of the range of subsp.

helleborine. It was mentioned from e.g. Ciergnon by Delforge *et al.* (2015) and Kreutz (2019) reported it from Brab. or. (Belgian and Dutch part of Sint-Pietersberg) and Brab. occ. (Charleroi area) as well as from Mar. (north of Antwerp). The taxonomic value of this variety is probably weak; it likely is a mere thermophilous ecotype. In France, this taxon was considered to be possibly conspecific with *E. distans* Arv.-Touv. (FG). The latter does not, according to SI-Flore and FG, occur further north than the Jura (see also Mathé 2015). However, according to Kreutz (2019) it is present in a single locality (in Niederkorn) in the Grand-Duchy of Luxembourg, from where it was initially reported by Krippel & Colling (2008; sub *E. helleborine* var. *orbicularis*). Chas & Tyteca (1992) and Delforge (2004) thoroughly discussed the morphology and ecology of *E. distans*. According to these authors, it is a morphologically and ecologically well-differentiated species, confined to thermophilous, basiphilous pine-woods and limited to mountainous to subalpine regions, where *E. helleborine* s.str. is absent (see also Scappaticci & Démares 2003). These conditions do not at all correspond with those described from the Niederkorn population. Pending further studies, preferably corroborated by molecular data, the genuine presence of *E. distans* in the Flora area requires confirmation.

- *E. helleborine* subsp. *neerlandica* (Verm.) Buttler: recent molecular analyses showed that this subspecies is genetically distinct but able to cross easily and to produce a large number of viable seeds (Jacquemyn *et al.* 2018). Kreutz (2019) also referred to intermediate forms, especially in the border zone between dunes and polders.

- Additional infraspecific taxa of *E. helleborine* have been recorded from the Flora area. Kreutz (2019) reported var. *minor* R. Engel from some Walloon localities and var. cf. *moratoria* (Riech. & Zirnsack) P. Delforge from Limburg in the Netherlands. However, Delforge (2016) demonstrated that the taxonomic value of these varieties is nihil.

- The conservation and rejection proposals for *E. purpurata* Smith and *E. viridiflora* Krock. respectively were accepted by the latest Congress (Shenzhen Code Appendices).

- *E. muelleri* Godf.: Kreutz (2009) newly described a var. *saltuaria* Kreutz from the Venn-Eifel in Germany. He later reported this variety from a single locality in the Grand-Duchy of Luxembourg as well, near Helmsange (Lorr. sept.) (Kreutz 2019). This apparently is a mere ecotype, morphologically more or less intermediate between *E. muelleri* and *E. leptochila*, and probably of limited taxonomic value.

- *E. leptochila* (Godf.) Godf.: two infraspecific taxa mentioned in NF6 are reduced from subspecies to varieties, var. *leptochila* and var. *neglecta* (Kümpel) A. Gévaudan. According to FG the taxonomic value of the latter is limited, it is better included in *E. leptochila* s.str., and this was recently confirmed based on molecular studies (Sramkó

et al. 2019). Mariamé & Delforge (2013) also emphasized the difficulties experienced in attributing variety names to the Belgian populations. Plants more or less intermediate between *E. helleborine* and *E. leptochila* are often thought to refer to var. *neglecta*. However, it must be taken into account that these two species also hybridize quite easily wherever they occur sympatrically (*E. ×stephensonii* Godf.) These hybrids are recognizable by the pale pink tint of the base of the pedicels (Mariamé & Delforge l.c.). However, since in the Flora area these two taxa are only exceptionally growing together, this hybrid is doubtlessly very rare, if present (comm. W. Van den Bussche 10.2022).

- *E. phyllanthes* G.E. Smith: the populations of this rare species in the Flora area have been ascribed to var. *degenera* D.P. Young, a variety with imperfectly differentiated labellum and flowers that are usually not opening (Van de Vijver 2006, Delforge *et al.* 2016). However, this assumption requires confirmation (provided that the described varieties have any taxonomic value). According to Kreutz (2019) our populations may as well belong to var. *pendula* D.P. Young.

- *Spiranthes* L.C.M. Rich.: a population of a hybrid between two North American species, *S. cernua* (L.) L.C.M. Rich. (more precisely a cultivar named ‘Chadds Ford’) and *S. odorata* (Nutt.) Lindl., survives since 2014 in a hay meadow in Beernem (Fl.). These often more robust plants differ from *S. aestivalis* in flowers that are arranged in 3-4 spiral rows (vs. arranged in a single spiral row). A natural (not artificial) hybrid of these two species was recently formally described as *S. bightensis* M.C. Pace (Pace 2021). In the Netherlands, yet another exotic species, *S. romanzoffiana* Cham., native to North America and the British Isles, was seen near Breda (Camp.) in 2014-15 but may have disappeared again (wn.nl; comm. W. Van den Bussche 10.2022). All of these plants are grown as ornamentals and seem to escape quite easily. Their naturalization and possible extension are monitored (Dekker 2012, Kreutz 2014, Meijrink 2014, Gravendeel 2016, Kreutz *et al.* 2016, van Run 2016, Kreutz 2019, Gravendeel *et al.* 2020).

- *Liparis loeselii* (L.) L.C.M. Rich.: according to Kreutz (2019), all plants from coastal areas belong to var. *ovata* Riddelsdell ex Godf., those from inland localities to var. *loeselii*. However, these are probably mere ecotypes of a single species, as suggested by molecular and morphometric studies (e.g. Terrasse & Wojtkowiak 1999, Vanden Broeck *et al.* 2014a & b).

- *Platanthera* L.C.M. Rich.: in recent years numerous studies were dedicated to the *P. bifolia-chlorantha* complex. These more precisely dealt with plants with morphological features intermediate between these two species and previously thought to be their hybrid, *P. ×hybrida* Brügger. It was shown, based on molecular data, that genuine hybrids are in fact very rare (Esposito *et al.* 2017). For non-hybrid, intermediate plants the name *P. fornicata*

(Bab.) Buttler (Buttler 2011) was rehabilitated and a new species was described, *P. muelleri* Baum et Baum (Baum & Baum 2017). These two ‘species’ doubtlessly occur in the Flora area, but a lot of controversy persists as to the application of these names. Kreutz (2019), for instance, although applying a very narrow species concept and accepting numerous infraspecific taxa, questioned the relevance of *P. muelleri* and completely left unmentioned *P. fornicata*. The former was said to partly refer to *P. ×hybrida* whereas its holotype was said to be identical with *P. bifolia* (L.) L.C.M. Rich. var. *latiflora* (Drejer) Kreutz. According to Delforge (2020) Kreutz’ *P. bifolia* var. *latis-sima* (Tinant) Thielens corresponds with *P. fornicata*.

Molecular studies in this complex are not conclusive. On the one hand, there appear to be intermediate individuals between these two plants and also some populations made up exclusively of such intermediates. Based on morphological, molecular and chemical arguments, it was demonstrated that most so-called ‘intermediates’ are in fact *P. bifolia* (Esposito *et al.* 2017). On the other hand, morphological and ecological comparisons carried out in Belgium argue in favor of the recognition of two independent taxa within *P. bifolia*. The latter binomial should be reserved for allopatric populations growing on acidic to basic soil, in open, cool to humid habitats. Populations of *P. bifolia*, often growing in sympatry with *P. chlorantha*, on basic soil, in semi-open to shaded habitats, could then be referable to *P. fornicata* (Tyteca & Esposito 2018). Durka *et al.* (2017) also detected three distinct lineages within the *P. bifolia/chlorantha* group, the third referring to non-hybrid intermediates. To conclude, apparently, there are likely four taxa involved: *P. bifolia* s.str., *P. chlorantha*, the very rare hybrid *P. ×hybrida* that only occurs in mixed populations and a less rare, intermediate non-hybrid species (best called *P. fornicata*?) that also occurs in places where the other species are absent. However, additional and more convincing studies are required.

The varieties recognized by Kreutz (2019) are not easily interpreted. Var. *bifolia* refers to plants from damp heaths whereas var. *latiflora* is confined to slightly drier habitats on limestone. Var. *latis-sima* was reported from the Belgian part of the Sint-Pietersberg. As suggested before, these taxa at least in part probably coincide with non-hybrid intermediate plants; FG considered them to be mere ecomorphs, without taxonomic value. They were removed from NF7.

- *Gymnadenia ×intermedia* Peterm.: it is unclear whether this binomial refers to the hybrid between *G. odoratissima* (L.) L.C.M. Rich. and *G. conopsea* s.str. or *G. densiflora*. It was therefore removed.

- *G. conopsea* (L.) R. Brown was segregated in two different species, *G. conopsea* s.str. and *G. densiflora* (Wahlenb.) A. Dietr. The latter was previously considered to be a mere variety in NF6, var. *densiflora* (Wahlenb.) Lindl. Molecular studies, however, have shown these two taxa to represent genetically quite distinct entities (Stark *et al.* 2011). Some additional morphological features, useful

for their separation (mostly based on FG) were added to the key. However, in the Flora area this complex remains quite confusing. Up to 4 or 5 ecotypes are known one of which may be *G. densiflora*. Large, richly flowered individuals that are sometimes found in ‘normal’ populations could be polyploids. In the Calestienne and Gaume (but also elsewhere) there are two ‘types’ that are differing in phenology, flower scent and leaves, but neither of them fits the description of *G. densiflora* exactly, and in the Xerobromium there is yet another ecotype that begins to flower the earliest (comm. W. Van den Bussche 10.2022).

- Kreutz (2019) reported several additional varieties of *G. conopsea* from the Flora area but the taxonomic relevance of these taxa requires confirmation. Var. *graminea* (Dworschak) Kreutz, a slender plant with very narrow leaves and a laxly-flowered inflorescence, is known from a single extant population in the Benelux in the Torfbroek nature reserve in Kampenhout. Var. *odorata* (Dworschak) Kreutz is characterized by its strong odor and is known, in the Flora area, from the Calestienne area. Finally, var. *serotina* Schönheit was mentioned, a late-flowering variety, known from the Torfbroek nature reserve in Kampenhout (which means that this reserve harbors four taxa from the *Gymnadenia conopsea* complex!) and from scattered localities in the Grand-Duchy of Luxembourg. The identity of var. *serotina* apparently was confirmed by Wucherpfennig who is familiar with this taxon in Bavaria.

- Two additional hybrids in *Ophrys* L. are known in the Flora area. *O. aranifera* Huds. × *virescens* M. Philippe (*O. ×jeanpertii* E.G. Camus) has been recorded in the Laon area in France (SI-Flore) and *O. virescens* × *insectifera* L. is occasionally seen in Arnaville near Metz in Lorr. (Dirwimmer *et al.* 2016).

- In NF6, *O. sphegodes* Mill. contained two subspecies, subsp. *sphegodes* and subsp. *araneola* (Reichenb.) Lainz. These are now accepted as two distinct species, *O. aranifera* Huds. and *O. virescens* M. Philippe, respectively.

- *O. apifera* Hudson: Kreutz (2019) reported not less than nine varieties from the Flora area: var. *aurita* (Moggride) Gremlé (e.g. Mar., Brab. or., Lorr.), var. *badensis* L. Lewis et Kreutz (Mar., Mosan, Lorr.), var. *belgarum* Turner Ettliger (Brab. or., Mosan), var. *bicolor* (O. Nae-geli) E. Nelson (Mosan, Lorr.), var. *curviflora* A. Soulié (Mar., Brab., Mosan), var. *friburgensis* Freyhold (absent from Belgium but reported from neighboring territories in Mar., Brab. or., Lorr.), var. *fulvofusca* M.P. Grasso et Scrugli (Mar. sept.), var. *atrofusca* J. Dierckx, Kreutz, D. Riepe et L. Segers (described from the Belgian part of Sint-Pietersberg and also known from Mar.) and var. *trollii* (Hegetschweiler) Reich. f. (Zeeland, the Netherlands). The author admits that (translated FV) “over the years the plants may look completely different or the flowers may return to their typical shape”. Hence, the taxonomic value of all these varieties is likely nihil.

- The species named *O. holosericea* (Burm. f.) Greuter in NF6 is now called again *O. fuciflora* (F.W. Schmidt)

Moench., following other recent Floras, e.g. FG, Stace (2019), etc.

- An additional species of *Himantoglossum* Spreng. has reached the Flora area, *H. robertianum* (Loisel.) P. Delforge. This species was formerly included in a separate genus, *Barlia* Parl. [as *B. robertiana* (Loisel.) Greuter], but that genus is in fact nested in *Himantoglossum*, see e.g. Bateman *et al.* (2017). It is now included in the key and a full account is provided.

- *H. hircinum* (L.) Spreng.: in NF6, a very rare variety (in reality rather a monstrosity) was reported from Mosan, var. *obtusum* De Langhe, characterized by an unusually short labellum. This variety was not mentioned by Kreutz (2019) but this author cited a further variety from the Flora area, var. *aestivalis* Kreutz et P. Steinfeld, a later-flowering ‘race’ with a laxer, few-flowered inflorescence and narrower, longer leaves. It is known from the Grand-Duchy of Luxembourg (Kayl; Lorr. sept.) (Kreutz & Steinfeld 2013) but its taxonomic value requires confirmation. Such parapatric populations may have been the result of polyploidization (Bateman *et al.* 2017).

- The generic limits of *Orchis* L. have considerably changed. Four species included in this genus in NF6 have now been transferred to *Anacamptis* L.C.M. Rich.: *O. coriophora* L., *O. morio* L., *O. palustris* Jacq. and *O. laxiflora* Lam.

- *Anacamptis pyramidalis* (L.) L.C.M. Rich.: Londo *et al.* (2016) assigned some coastal populations from France (in the Flora area: Calais, Dunkerque) and the Netherlands to a newly described var. *dunensis* Londo, Kreutz et Slings. According to the authors this is not a mere ecotype although genetical evidence is still lacking (H24). In var. *dunensis* stems are slightly S-curved and corollas paler than in the nominal variety. However, judging from photographs in Kreutz (2019) plants of var. *pyramidalis* from the Grand-Duchy of Luxembourg have a similarly S-curved stem (Niederanven, p. 124) and plants from Differdange (p. 124) have paler corollas than some plants depicted of var. *dunensis*. In the absence of further evidence, in NF7 no mention is made yet of this variety.

- *Coeloglossum viride* (L.) Hartm. has now been transferred to *Dactylorhiza* Neck. ex Nevski [*D. viridis* (L.) R.M. Bateman, Pridgeon et M.W. Chase], following recent insights inferred from molecular studies (e.g. Bateman & Rudall 2018).

- *Dactylorhiza ×dinglensis* (Wilmott) Soó: in NF6, this binomial was applied to designate hybrids of *D. maculata* with *D. majalis*. However, *D. ×dinglensis* is the hybrid of *D. maculata* (probably subsp. *ericetorum*) with the Irish endemic *D. kerryensis* (Wilmott) P.F. Hunt et Summerh. (previously incorrectly placed in synonymy with *D. majalis*, a species that is absent in the British Isles) (Stace 2019). The correct name for our hybrid is probably *D. ×vermeuleniana* Soó.

- *D. incarnata* (L.) Soó: the infraspecific variability of this species in the Flora area is poorly understood. Rather

numerous infraspecific taxa have been reported lately, especially by Kreutz (2019), but the taxonomic value of most of these taxa needs to be confirmed by molecular studies. Two subspecies that were already recognized in NF6 are now reduced to varietal rank, var. *incarnata* and var. *serotina* Hausskn. [as subsp. *pulchella* (Druce) Soó in NF6], following FG. The application of the latter epithet [*D. incarnata* (L.) Soó subsp. *pulchella* (Druce) Soó; *D. pulchella* (Druce) Averyanov], moreover, is debatable since this taxon might rather be a British endemic, confined to neutral to acid wet peaty places (Stace 2019). It was therefore removed from the synonymy of var. *serotina*. A third variety, var. *lobelii* (Verm.) Soó, a compact ‘race’ from coastal dunes, very likely also occurs in the Flora area (wn.be, H24, Kreutz 2019) but its taxonomic status is questionable (plants with such characteristics usually occur as an ‘extreme form’ within populations of var. *incarnata* in coastal dunes; comm. M. Leten, 10.2022). It was mentioned by Delforge (2012) for some dune valleys in the Netherlands and further north to Norway and said to be sometimes erroneously referred, by Kreutz among others, to as *D. coccinea* (Pugsley) Averyanov, the latter being a British endemic. However, Delforge & Breuer (2015) also reported this variety from the Doolaege nature reserve in Oostduinkerke and Kreutz (2019) provides, as far as the Flora area is concerned, further records from Belgian and Dutch (Zeeland) coastal regions.

Kreutz (2019) reported several additional infraspecific taxa from the Flora area. var. *haematodes* (Reichenb. f.) Soó, distinguished from the other varieties by its clearly spotted leaves, is known from a single locality in Ekeren (Ekers Moeras) where it grows along with var. *incarnata*. It is unknown how this variety relates to other spotted variants of *D. incarnata*, e.g. subsp. *cruenta* (O.F. Muell.) P.D. Sell. The presence or absence of spots on the leaves probably is a poor taxonomic character in this species (Hedrén & Nordström 2009). Var. *latissima* (Zapalowicz) Hylander is a taller plant with wider leaves and longer floral bracts; it is reported from a canal embankment in Moen (Brab.) and is also known from the Netherlands but was not mentioned in H24. It is probably of little or no taxonomic value. Var. *dunensis* (Druce) Hylander has a distribution in the Flora area that roughly coincides with that of var. *lobelii*. It is a mere dwarf form and likely of no taxonomic value at all (despite being present in the Netherlands, it was ignored in H24). Subsp. *coccinea* (Pugsley) Soó was long considered to be a British endemic. According to Kreutz (2019) it also occurs in coastal areas in the Netherlands, including in Zeeland in the Flora area. Given the fact that this subspecies was absent before 1980, it likely reached the Netherlands in relatively recent times, probably as a result of a natural range extension (wind dispersal). However, this subspecies chiefly occurs on the western coast of the British Isles and is virtually absent on the eastern coast (Stace 2019; see also Online Atlas of the British and Irish Flora: <https://www.brc.ac.uk/plantatlas/>) which makes this assumption rather unlikely. It has ruby

to crimson red perianths and flowers two to three weeks later than var. *incarnata*. Plants of this subspecies originating in Wassenaar in the Netherlands, well beyond the limits of the Flora area, had a quite different cellular DNA content (genome size) as compared with typical plants of *D. incarnata*, suggesting that they indeed represent a distinct taxon (Zonneveld 2019). Similar-looking plants have also been observed in Belgian coastal areas but these proved to be genetically identical with *D. incarnata* var. *dunensis*, apparently indicating that flower color does not serve for the recognition of infraspecific taxa. Finally, subsp. *cungsii* Kreutz has been observed in a single locality in the Flora area, in an abandoned iron ore quarry near Differdange (Lorr. sept.) in the Grand Duchy of Luxembourg. In fact, this subspecies was newly described from that locality by Kreutz (2015; see also Krippel & Colling 2016). It is a coarse plant with wide leaves and probably of little, if any, taxonomic value. Pending further studies – preferably molecular-based – no further attention was paid to the infraspecific variability of *D. incarnata*, although it is possible or even plausible that some deserve formal taxonomic recognition.

- *D. traunsteineri* (Sauter) Soó: the genuine identity of plants found in the Flora area has been subjected to debate. The plants from northeastern France (Haute-Marne department) mentioned in NF6 were recently attributed to a separate species, *D. devillersiorum* P. Delforge (Delforge 2011; see also Kreutz 2019 who reported the same species from the Laon area). The same plants have also sometimes been assigned – incorrectly so – to *D. wirtgenii* (Höppner) Soó, the latter being a synonym of *D. ×carnea* (E.G. Camus) Soó [*D. incarnata* (L.) Soó × *maculata* (L.) Soó] (Delforge 2011, FG). The taxonomic interpretation of the *D. traunsteineri* group (composed of sexual, highly interfertile taxa!) has changed a lot over time. According to some authors it comprises three distinct, geographically isolated species: *D. traunsteineri* s.str. (Alps), *D. traunsteinerioides* (Pugsley) Landwehr (the British Isles) and *D. lapponica* (Reichenb. f.) Soó (Scandinavia) (Bateman & Denholm 2012). However, recent genetic research seems to indicate that the morphological variation is best understood as one variable species (Brandrud *et al.* 2020). Therefore, the name *D. traunsteineri* was upheld, incl. *D. devillersiorum*.

- *D. praetermissa* (Druce) Soó: the infraspecific variability of this species in the Flora area is poorly understood, although the taxonomic value of many infrataxa (see e.g. Kreutz 2019) probably is small. Two subspecies were recognized in NF6 [subsp. *praetermissa* and subsp. *integrata* (E.G. Camus ex Fourcy) Soó] but an in-depth study of northwestern European populations, based on morphology and genetics, is still lacking (H24) and yet highly desirable. However, coastal populations that have been assigned to ‘subsp. *integrata*’ are morphologically variable and in fact differ from one year to another (comm. M. Leten, 10.2022). FG already pointed out that plants with an isodiametric, undivided labellum (the sole character

that distinguishes subsp. *integrata*) actually belong to the variation of subsp. *praetermissa*. It was therefore reduced to the synonymy of subsp. *praetermissa*.

In addition to the taxa mentioned in NF6, Kreutz (2019) reported two further infraspecific taxa. Var. *bracteosa* Kreutz was recently described by Kreutz (2016) based on specimens found in the Doolaeghe nature reserve in Oostduinkerke (Mar.) in Belgium. Similar plants were subsequently observed in other localities in the same coastal area between Oostduinkerke and Nieuwpoort. These plants only differ by the presence of conspicuous floral bracts but are probably of no taxonomic value. In fact, they probably represent F2 hybrids between *D. incarnata* and *D. praetermissa* (most likely backcrosses with the former). A second infraspecific taxon, subsp. *schoenophila* R.M. Bateman et Denholm, recently described from the British Isles, is doubtlessly of more importance. This name encompasses populations located in southeast England, south of a line from the Severn to the Wash, that were formerly attributed to *D. traunsteinerioides* (at least in part erroneously so, see also NF6) on the basis of their gross morphology and habitat preference; however, they have genotypes characteristic of *D. praetermissa* (Bateman & Denholm 2012) and were thus subsumed under that species (although they are likely of hybrid origin as well, probably of *D. praetermissa* × *traunsteinerioides* parentage). Aberrant plants from the Torfbroek nature reserve in Kampenhout (Brab.) were ascribed to this taxon by Kreutz (2019) and a photo confirmed them to “look like a convincing population” of this subspecies by R.M. Bateman (in Kreutz l.c.). It has been present there since many decades (previous reports of *D. incarnata* and *D. praetermissa* from there need to be referred to it) and certainly does not represent a hybrid that arose *in situ* (except for the very different *D. fuchsii*, no further species of *Dactylorhiza* are present in the Torfbroek reserve) (comm. M. Leten, 10.2022; see also Meeuwis 2005). Its ecology is also in line with that of subsp. *schoenophila*, i.e. chalk marshes with *Schoenus nigricans*, a habitat in which subsp. *praetermissa* is completely absent. This subspecies was added and opposed to subsp. *praetermissa*.

- *D. sphagnicola* (Höppner) Averyanov: Kreutz (2019) reported two varieties from the Dutch province of Limburg, within the limits of the Flora area. Var. *deweveri* (Vermeulen) Kreutz is probably a stabilized hybrid, involving either *D. maculata* or *D. incarnata*. It is at present only known from Brunssum and Schinveld (claims from the Belgian Plateau de Tailles are erroneous according to Kreutz). A second variety, var. *hoepneri* (A. Fuchs) Kreutz, is known in the Flora area from the Roermond area. It probably refers to stabilized hybrids between *D. sphagnicola* and *D. praetermissa*. Although known from the Netherlands, these two varieties were completely ignored in H24, their taxonomic value probably being weak.

- *D. majalis* (Reichenb.) P.F. Hunt et Summerh.: Kreutz (2019) reported var. *brevifolia* (Bisse) Kreutz from the

Sampont marshes in Vance. It is a mere ecotype and thus of very limited taxonomic value.

- *D. maculata* (L.) Soó subsp. *arduennensis* (Zadoks) Tournay: in NF6, it was suggested that some plants of *D. maculata* subsp. *maculata* in fact may refer to this taxon. Kreutz (2019) confirmed this identity but reduced it to varietal rank, as var. *arduennensis* (Zadoks) Kreutz. However, since it is a mere robust ecotype it probably is of no taxonomic value at all.

- A new species of *Dactylorhiza* was recently described from hills in the valley of river Maas, *D. montis-mosae* Kreutz (2017, 2019). These plants in fact represent hybridogenous populations of *D. fuchsii* (Druce) Soó and *D. praetermissa* (more precisely with a variant that sometimes is referred to as ‘subsp. *integrata*’) and potentially can be found wherever these two species occur sympatrically. In addition to the Sint-Pietersberg area, from where it was initially described, it was subsequently also recorded at the Belgian coast (Doornpanne nature reserve), near Differdange in the Grand-Duchy of Luxembourg and in Kerkrade in the Netherlands. Despite being present in the Netherlands, this species was ignored in H24. Such plants can be subsumed under *D. ×grandis* (Druce) P.F. Hunt, the known hybrid between these two species.

- A proposal for the rejection of the binomial *Orchis latifolia* L., basionym of *Dactylorhiza latifolia* (L.) Soó, was accepted by the latest Congress (Shenzhen Code Appendices).

51. Iridaceae

- An additional *Crocus* L., *C. ×stellaris* Haw. (a hybrid of *C. angustifolius* Weston and *C. flavus* Weston), is much grown these days and regularly observed as an escape or throw-out (wn.be).

- An additional *Iris* L., *I. ×hollandica* H.R. Wehrh. (as for the valid name, see Shaw 2021), is rarely grown for ornament and exceptionally seen in the wild (Izegem, 2017; wn.be).

- Three additional species of *Sisyrinchium* L. have been recorded in the Flora area (wn.be): *S. angustifolium* Mill., *S. californicum* (Ker-Gawl.) Dryand. and *S. striatum* Sm. One of these species, *S. californicum* (with yellow corollas), may be in the process of local naturalization in Mar. sept. (Zeeland) (FZ).

- *Crocsmia* Planch.: the exact identity of plants found in cultivation and as escapes is not always clear. They are usually referred to *C. ×crocsmiiflora* (Lemoine) N.E. Brown but at least some may belong to other species or hybrids.

52. Asphodelaceae

- A weedy species has been recorded as a grain alien, *Asphodelus tenuifolius* Cav. (port of Antwerp, 2019-2022; wn.be).

- One of the species of *Kniphofia* Moench. that are frequently grown as ornamentals has been recorded as an

escape, *K. ×praecox* Baker. A more or less established population persists in a railway siding in Wervik since 2015 (wn.be).

53. Amaryllidaceae

- A cultivated ornamental, *Ipheion uniflorum* (Graham) Raf. [syn.: *Tristagma uniflorum* (Lindl.) Traub], has regularly been recorded as an escape from cultivation since 2012 (wn.be).

- Several additional species of *Allium* L. have recently been recorded as escapes from cultivation: *A. cristophii* Trautv., *A. hollandicum* R.M. Fritsch (syn.: *A. aflatunense* auct.), *A. karataviense* Regel, *A. lusitanicum* Lam., *A. macleanii* Baker, *A. moly* L., *A. nigrum* L., *A. pendulinum* Ten., *A. ramosum* L., *A. roseum* L., *A. triquetrum* L. and *A. zebdanense* Boiss. et Noë (wn.be). Some of these species are locally persisting or even more or less naturalizing.

- Several additional taxa of *Narcissus* L. have recently been recorded as escapes from cultivation: *N. obvallaris* Salisb., *N. tazetta* L., *N. ×cyclazetta* Chater et Stace (wn.be) and doubtlessly several others as well. They are often hard to identify and include complex hybrids, cultivars, etc.

- Several additional species of *Galanthus* L. have recently been recorded as escapes from cultivation: *G. elwesii* Hook. f., *G. plicatus* Bieb. and *G. woronowii* Losinsk. (syn.?: *G. ikariae* Baker) (wn.be).

54. Asparagaceae

- Several additional species from genera not treated in detail have recently been recorded as escapes from cultivation: *Agave americana* L., *Camassia leichtlinii* (Baker) S. Watson subsp. *suksdorfii* (Greenman) Gould, *Chlorophytum comosum* (Thunb.) Jacques, *Danae racemosa* (L.) Moench, *Liriope muscari* (Decaisne) L.H. Bailey, *Ophiopogon jaburan* (Siebold) Lodd., *Pseudomuscari azureum* (Fenzl) Garbari et Greuter (syn.: *Muscari azurea* Fenzl), *Puschkinia scilloides* Adams and *Triteleia laxa* Benth. (wn.be).

- The correct name for the variety of *Yucca gloriosa* L. called var. *recurvifolia* (Salisb.) Engelm. in NF6 is var. *tristis* Carr. (POWO).

- Several species that were formerly included in the genus *Scilla* L. are cultivated for ornament in gardens and parks. In addition to those already mentioned in NF6, *Chionodoxa forbesii* Baker [syn.: *Scilla forbesii* (Baker) Speta] has been recorded as an escape from cultivation (wn.be). In general, plants of *Scilla* s.l. shown on wn.be are often difficult to identify unambiguously; perhaps many of them refer to hybrids. From Eifel centr. an additional species has also been identified, *Ch. siehei* Stapf [syn.: *S. siehei* (Stapf) Speta] (FT), although the latter may not be specifically distinct from *Ch. forbesii*. This group requires further study in the Flora area.

- *Asparagus officinalis* L. subsp. *prostratus* (Dum.) Corb.: a character useful for the separation of this sub-

species was added: its cladodes are usually glaucous (FG, H24). However, even then, the populations observed in the territory of the Flora area are much less typical than those of, for instance, Bretagne in France, possibly resulting from introgression with subsp. *officinalis* (comm. M. Leten 06.2017).

- Two alien species of *Maianthemum* Wiggers, *M. dilatatum* (Alph. Wood) A. Nelson et J. F. Macbride (Peer, 2013) and *M. stellatum* (L.) Link [syn.: *Smilacina stellata* (L.) Desf.] (Brasschaat, since 2016; a rather large, apparently long-naturalized population in natural *Quercus* woodland) have been recorded as escapes from cultivation (wn.be).

- The genus *Ornithogalum* L. was dismantled and now only includes *O. umbellatum* L. s.l. in the Flora area. In NF6, the latter species was treated with two subspecies, subsp. *divergens* (Boreau) Bonnier et Layens and subsp. *umbellatum*, that are now treated as two distinct species, *O. divergens* Boreau and *O. umbellatum* s.str. respectively, following FG (contrary to H24 and Stace 2019). *Ornithogalum nutans* L. was transferred to *Honorius* S.F. Gray and was segregated in two species, *H. nutans* (Sm.) S.F. Gray s.str. and *H. boucheanus* (Kunth) Holub (previously as two subspecies of *O. nutans* in NF6). Finally, species related to *O. pyrenaicum* L. were transferred to *Loncomelos* Raf., as *L. pyrenaicum* (L.) Holub. In the Flora area, the latter genus is further represented by the following species: *L. brevistylus* (Wolfner) Dostál [syn.: *L. pyramidale* (L.) Raf., *O. pyramidale* L.] and *L. narbonense* (L.) Raf. (syn.: *O. narbonense* L.).

- Several additional species of *Muscari* Mill. are grown as ornamentals and at least one has recently been recorded as an escape from cultivation: *M. latifolium* J. Kirk, characterized by leaves up to 30 mm wide, has occasionally been recorded since 2014 (wn.be).

- *M. neglectum* Guss. ex Ten.: the correct name for the 'northern' taxon of this complex is *M. neglectum*. *M. atlanticum* Boiss. et Reut. is a Mediterranean species (FG; Garbari 2003). See also Hauteclair & Lambinon (2012).

- The separation of *M. neglectum* and *M. armeniacum* Leichtlin ex Baker is not always straightforward, especially in dried specimens. They are most easily distinguished in the field, based on flower scent and color (Hauteclair & Lambinon 2012; see also FG). Pruinosity of flowers, as mentioned in NF6, is not a reliable character and thus was removed (comm. I. Hoste, 05.2018).

55. Commelinaceae

- An additional ornamental species has been recorded as an escape from cultivation: *Tinantia erecta* (Jacq.) Schlecht. It was collected for the first time in 1956 already (as noticed in herbarium BR) and more recently also observed in Sint-Eloois-Vijve in 2017 (wn.be).

58. Typhaceae

- Plants intermediate between *Sparganium angustifolium* Michaux and *S. emersum* Rehm. have been reliably

recorded in several localities in Camp. (Fuhrmann 2013). These two species are closely related and indeed produce fertile hybrids.

- *S. erectum* L. includes four (not three) subspecies. In addition to those already listed in NF6 subsp. *oocarpum* (Čelak.) Domin should be sought. It is intermediate between subsp. *erectum* and *neglectum* (Beeby) K. Richt. and considered to be their hybrid (Pišová & Fér 2020). Its fruits are predominantly aborted whereas those that are developed are globular and up to 7 mm across.

- A second hybrid in *Typha* L., *T. ×provincialis* A. Camus [*T. domingensis* (Pers.) Steud. × *latifolia* L.], is known from one locality in Kortrijk (Brab.). It is characterized by its leaves and sheaths with numerous orange mucilaginous glands and by its pale brown female part of the spadix when ripe.

- A characteristic feature for the recognition of the alien *T. minima* Funck, i.e. the spherical or briefly obovoid female part of the spadix, was added.

- *T. laxmannii* Lepechin was already briefly mentioned in NF6; since it has naturalized in several localities throughout the territory, it is now keyed-out and treated in detail.

59. Juncaceae

- An alien species of *Luzula* DC. is sometimes recorded as an escape from cultivation, *L. nivea* (L.) DC. (wn.be). It is briefly described.

- The infrageneric taxa of *L. luzuloides* (Lam.) Dandy et Wilmott were reduced to varietal rank, var. *erythranthema* (Wallr.) I. Grint. [as subsp. *rubella* (Hoppe ex Mert. et Koch) Holub in NF6] and var. *luzuloides*.

- Two subspecies of *L. multiflora* (Ehrh.) Lej. were recognized in NF6; these are now treated as two distinct species, *L. congesta* (Thuill.) Lej. and *L. multiflora* s.str., following recent insights and Floras (FG, H24). Plants with more or less intermediate characters are sometimes encountered; it is unclear whether or not these are hybrids or rather indicate weak species boundaries.

- The correct name for *L. pallescens* Swartz is *L. pallidula* Kirschner according to some authors (Kirschner 1990; see also FG). Most recent authors, however, do not follow this viewpoint.

- Two additional alien species of *Juncus* L. have been recorded: *J. acuminatus* Michaux (Aptroot 2018) near Tilburg since 2017 and *J. xiphioides* E. Mey. in Blankenberge (Mar.) since 2016 (Verloove *et al.* 2017a). Both are treated under nrs. 23 (*J. canadensis*) and 25 (*J. ensifolius*) respectively, the species they most closely resemble. Many additional exotic species, mostly native to Australia and New Zealand, have been discovered in the hygrophilic meadows along the Meuse river (Dutch side) downstream from Maastricht since 2016. These species have germinated from the seed bank after extensive works in the alluvial plain; they undoubtedly are remnants of the former wool alien flora and were introduced a long time

ago upstream (especially in the Vesdre valley). Their fate is uncertain but at least a few species seem to have established themselves at least temporarily. Their exact identity should be checked carefully although at least 19 species seem to be involved (Verloove *et al.* in prep.).

- A small population of *J. striatus* Schousb. ex E. Mey., native to the western Mediterranean region, persists since 2015 in a humid dune depression in Koksijde (Mar.) (Leten & Verloove in prep.). Its origin is uncertain: recent arrival of diaspores or germination of seeds buried in the seedbank? This species closely resembles *J. acutiflorus* Ehrh. ex Hoffmann; characteristics useful for their separation are provided.

- *J. tenuis* Willd. now includes four subspecies in the Flora area: subsp. *dichotomus* (Elliott) Verloove et Lambinon was added (Hoste & Verloove 2016). It was already collected in the 19th century in Belgium but remained overlooked until recently. Besides, the rank given to these infraspecific taxa is debatable. Recent American Floras often treat them at specific rank. However, certain populations appear to be more or less intermediate. In addition, hybridization has been reported in the Netherlands, between subsp. *dudleyi* and *tenuis* (Corporaal & Schaminée 2015). Problem to be re-studied.

- *J. bufonius* L. subsp. *minutulus* Krecz. et Gontsch. ex Soó has no taxonomic value, according to Rooks *et al.* (2011) and is now included in subsp. *bufonius*. Var. *congestus* Wahlb. is an older name than var. *parvulus* Hartm. and thus has priority. The taxonomic value of this variety appears to be limited.

- *J. anceps* Laharpe: the infraspecific identity of the populations found in the Flora area should be carefully verified. Two morphological types seem to be present: the plants from Knokke and Zeebrugge rather belong to var. *atricapillus* (Drejer ex Lange) Buchenau (i.e., stocky plants with condensed inflorescences) while the plants from Oostduinkerke and Koksijde differ in being taller, with more open inflorescences and distinctly flattened, keeled leaves (Leten in prep.). This last type of plants would rather correspond to var. *anceps* s.str. This problem needs to be studied again.

- A full account is now provided for *J. ensifolius* Wikstr. and the species is included in the key.

60. Cyperaceae

- *Eleocharis engelmannii* Steud.: this North American species is increasingly recorded in the Flora area and is locally naturalized. A full account is thus provided and the species is included in the key (Verloove 2015, Simons *et al.* 2020).

- *E. palustris* (L.) Roem. et Schult.: the correct name for the subspecies called *vulgaris* in NF6 is subsp. *waltersii* Bures et Danihelka (Bures & Danihelka 2008).

- *E. austriaca* Hayek is better considered as a subspecies or even variety of *E. mamillata* Lindb. f., subsp. *austriaca* (Hayek) Strandh. (Gregor 2003; see also FG).

- The genus *Bolboschoenus* (Aschers.) Palla was completely revised. A key and full account is now provided for four species (a single species in NF6): *B. maritimus* (L.) Palla s.str., *B. laticarpus* Marhold, Hroudová, Zákavský et Ducháček, *B. yagara* (Ohwi) Yung C. Yang et M. Zhan and *B. planiculmis* (F. Schmidt) T. Egorova. A fifth species, *B. glaucus* (Lam.) S.G. Smith, was recorded once as a casual alien (Antwerp, 2015). Hybridization can complicate species identification in this complex (Píšová *et al.* 2017).

- The two subspecies of the North American *Scirpus atrovirens* Willd. are now accepted as distinct species, *S. georgianus* R.M. Harper and *S. hattorianus* Makino, following recent American flora accounts (see also FG).

- Another North American species, *S. cyperinus* (L.) Kunth, is naturalized in Camp., both in Belgium and the Netherlands. It is keyed-out and a full account is provided. This species occurs near Eindhoven since 2015 and is well-established there (Spronk 2016). Since 2018 it has also been known from a single Belgian locality (near Hoogstraten). As this is a potentially invasive species, an attempt was made to eradicate it in the latter locality in 2019 (at that time ca. 1000 individuals were present, including many seedlings in the riparian zone). The species was eradicated manually and is under control now but monitoring will be needed for several years to prevent the species from spreading again (comm. B. Hoeymans 02.2021).

- *Schoenoplectus supinus* (L.) Palla: this species has never been mentioned from the Flora area. It occurs spontaneously in the Moselle valley, near Trier (Germany), just outside the territory of the Flora (FT). However, it was also present in the past in Ard. (west of Charleville-Mézières, in France) and in Tert. par. (northeast of Paris) (last seen around 1938; SI-Flore). Around 2005, it was discovered in Champ. near Troyes (Didier *et al.* 2011-2012), at the southern limit of the Flora area, but it seems rather unstable at its stations. Like *S. mucronatus* (L.) Palla, it is an annual plant but its stems are subcylindrical, usually spreading or ascending and with a perigone with 0-3 bristles (perigone with 6 bristles in *S. mucronatus*).

- An alien species of *Schoenoplectus*, *S. bucharicus* (Roshch.) Grossh., was recorded as an ephemeral alien in Antwerp in 2014-2015 (wn.be).

- *Cyperus michelianus* (L.) Delile: this southern species was rediscovered in 2017 in the Brienne le Château area (Etang de la Motte, Aube department; Champ. mér.), at the extreme southern limit of the Flora area, more than 60 years after its last appearance there (Lanfant & Régnier 2018; database CBN Paris). Only one or two plants were observed and its survival needs to be confirmed. Therefore, this species was not (yet) added to the key but a future expansion towards the Flora area, further enhanced by a changing climate, cannot be ruled out.

- *C. longus* L. is usually represented by subsp. *longus* in the Flora area. However, a population known since 2009

in Koksijde (Fluithoekduinen nature reserve) seems to belong to subsp. *badius* (Desf.) Bonnier et Layens (Leten & Verloove in prep.). The same subspecies was also reported from a lake margin in the Grand-Duchy of Luxembourg (Lorr. district) (Krippel & Colling 2016) but this identity requires confirmation.

- *Carex liparocarpos* Gaudin: this species has been reported on several occasions from the French part of the Flora area, for instance from the Parc naturel régional de Lorraine between Metz and Nancy. However, according to Welk & Oesau (2019) these are erroneous claims.

- An important character to separate *C. flava* L. from *C. lepidocarpa* Tausch was added to the identification key, i.e. the shape of the ligule (see van der Meijden & Holverda 2006; comm. M. Leten, 05.2018). The degree to which the beak of the utricles is scabrid (as mentioned in NF6), on the contrary, was shown to be an unreliable feature, based on extended multivariate studies on plant material from northwestern France (Duluc 2019). The same study demonstrated that *C. lepidocarpa* has small utricles with short beaks and the percentage of retrorse utricles is greater than 50%, whereas *C. flava* has larger utricles with a longer beak and a ratio of retrorse utricles of less than 50% (see also FG, H24). But even then, only extremes can be reliably identified: plants with more or less intermediate utricule features (that thus could be considered to be their (sterile) hybrid) proved to be fertile which rejects this hypothesis.

- Several additional alien species of *Carex* L. were recorded recently (wn.be): *C. loliacea* L. (port of Ghent, 2015), *C. melanostachya* Bieb. ex Willd. (Koopman *et al.* 2014; also treated in some more detail under n° 50 *C. acutiformis* Ehrh.), *C. morrowii* Boott (several records as escape from cultivation), *C. muskingumensis* Schweinitz and *C. scoparia* Schkuhr ex Willd. (also treated in some more detail under n° 26 *C. crawfordii* Fernald) (see also Verloove 2016).

- An additional *Carex* hybrid was recorded in the Flora area: *C. divulsa* Stokes × *muricata* L. (Mol, 2011; identity confirmed by Ana Molina, Spain).

- Some nomenclatural issues were solved: *C. ×fulva* Good. is indeed the correct name for *C. demissa* Vahl ex Hartm. × *hostiana* DC. (Koopman 2011). The correct name for the hybrid *C. flava* × *lepidocarpa* is *C. ×ruedtii* Kneucker (1891), not *C. ×pieperiana* Junge (1904) (Koopman 2011) and *C. ×pseudomairei* E.G. Camus is indeed the correct name for *C. lepidocarpa* × *mairei* Coss. et Germ. (Koopman 2011).

- *C. ligerica* J. Gay en *C. colchica* J. Gay are conspecific and both names were first published by Gay in the same paper. Chronologically, *C. colchica* appeared first and thus has priority over *C. ligerica* (see also Koopman 2011).

- All recent authors accept the conspecificity of *C. reichenbachii* Bonnett and *C. pseudobrizoides* Clavaud (e.g. Koopman 2011, FG, H24), the latter binomial having nomenclatural priority.

- The correct name for *C. praecox* Schreb. subsp. *intermedia* (Čelak.) Schultze-Motel is *C. praecox* subsp. *curvata* (Knaf) Vollm. (Koopman 2011).

- The correct name for *C. cuprina* (Sándor ex Heuffel) Nendtvich ex A. Kerner is *C. otrubae* Podp. (Koopman 2011).

- The taxonomy of the *C. muricata* group has considerably changed. Four separate species are now accepted: *C. muricata* L. s.str. and *C. pairae* F.W. Schultz on the one hand and *C. divulsa* Stokes and *C. leersii* F.W. Schultz on the other (Molina *et al.* 2008, Koopman 2011). A fifth species, *C. nordica* Molina, Acedo et Llamas, has also been reported from the Flora area, including from Belgium, but the taxonomic value of this species is contested (comm. J. Koopman, 09.2020; see also Gregor 2014). According to Duluc (2019) it represents a mere juvenile morph of *C. leersii*.

- The conservation and rejection proposals for *C. leersii* F.W. Schultz and *C. chabertii* F.W. Schultz respectively were accepted by the latest Congress (Shenzhen Code Appendices).

- The correct name for *C. ovalis* Good. is *C. leporina* L. (Koopman 2011).

- An American species much reminiscent of *C. crawfordii* Fernald has been observed occasionally since 2013 on pond margins in Camp. and Brab., *C. scoparia* Willd. Its utricles are 1.2-2 mm wide and 4.2-6.8 mm long when mature and its achenes 0.7-0.9 mm wide (in *C. crawfordii* the utricule is 0.9-1.3 mm wide and 3.4-4.1 mm long and the achene 0.6-0.8 mm wide) (Koopman 2015, Verloove 2016).

- The species status of *C. lepidocarpa* Tausch was maintained, in accordance with recent authors (Jiménez-Mejías *et al.* 2014). It had been suggested that this species is better seen as a subspecies of *C. viridula* Michaux.

- *C. viridula* Michaux: the two varieties that were distinguished in NF6, var. *viridula* and var. *pulchella* (Lönnr.) B. Schmid, were tentatively maintained. However, they may turn out to be mere ecotypes and thus of limited or no taxonomic value at all (Więclaw 2018).

- An alien species similar to *C. acutiformis* Ehrh., *C. melanostachya* Bieb. ex Willd., originally from Central and eastern Europe and Asia, has been known since 2010 from a single locality in Antwerpen-Linkeroever where it was probably introduced a long time ago already (Koopman *et al.* 2014). It differs from *C. acutiformis* by its shorter female spike (10-20 × 5-7 mm), its utricule with distinctly depressed veins at maturity, its hairy leaf sheath (at least in this population) and its leaves 2-4 mm wide. Although clearly established in this locality, no full account for this species was provided because the growing place may disappear/has disappeared after infrastructural works (Oosterweel link).

- *C. nigra* (L.) Reichard: the presence or absence of stomata on upper and/or lower leaf surfaces enables to distin-

guish between this species, *C. acuta* L. and their hybrid, *C. ×elytroides* Fries, which is not quite rare and probably overlooked (Hoste & Verloove 2017). *C. nigra* has abundant stomata on the upper surface of the leaf (and usually no or few stomata on the lower surface of the leaf), *C. acuta* has abundant stomata on the lower surface of the leaf (and usually no stomata on the upper surface), their hybrid usually has abundant stomata on both leaf surfaces (comm. I. Hoste & M. Porter, 09.2021).

- *C. pendula* Huds.: two subspecies are now recognized in the Flora area, subsp. *pendula* and subsp. *agastachys* (L. f.) Ljungstrand. The latter is separated based on its rather obovate utricles, purple-reddish ligule edges and scabrous peduncles of the female spike. According to most authors, partly based on molecular data, these are in fact two distinct species (Jiménez-Mejías *et al.* 2017, Míguez *et al.* 2017), although fertile intermediates are regularly observed (see also H24). Their distribution and frequency in the Flora area should be investigated. Subsp. *agastachys* is considered to occupy the eastern portion of the species' distribution range whereas subsp. *pendula* is restricted to the western portion. At first sight, this is not corroborated by historical herbarium collections from the Flora area.

61. Poaceae

- Key: in the key to species in NF6 for *Tragus* the lemmas were said to be spiny on the back. In reality, the glumes have a row of spines on the back, not the lemmas.
- With respect to alien species not treated in detail:
 - *Cortaderia selloana* (Schult. et Schult. f.) Aschers. et Graebn.: although usually dioecious, there are also monoecious races and these result in the species increasingly reproducing from seed. Armitage (2012) listed all named cultivars with their gender; eight of them are hermaphrodite (male fertile). Self-sown plants are often found in rather remote localities (e.g. port areas) far away from gardens or ornamental plantations.
 - Name changes in Poaceae are listed in Table 1.
 - Bamboos: the nomenclature and taxonomy are very complex. *×Pseudosasa japonica* (Siebold et Zucc. ex

Steud.) Makino ex Nakai appears to be an intergeneric hybrid of *Arundinaria hindsii* Munro × *Sasa borealis* (Hack.) Makino et Shibata parentage (FG and references therein). One additional bamboo was found as an escape: *×Semiarundinaria fastuosa* (Mitford) Makino [*Arundinaria simonii* (Carrière) Riviere et C. Riviere × *Phyllostachys bambusoides* Siebold et Zucc.]. Two name changes were implemented; see Table 1 (*Thamnocalamus* and *×Sasinaria*). The exact identity and status of most species needs to be reconsidered and *Phyllostachys* Siebold et Zucc. has never been seriously studied. Most species do not really run wild but they can sometimes form large populations as relicts of cultivation or from discarded garden waste.

- Newly recorded aliens from genera not treated in detail: *Diplachne fusca* (L.) Beauv. ex Roem. et Schult. var. *fascicularis* (Lam.) P.M. Peterson et N. Snow (Antwerp, 2016), *Eriochloa villosa* (Thunb.) Kunth (Ghent, 2016), *Oryza sativa* L. (Antwerp, 2018), *Paspalum notatum* Flueggé (Antwerp, 2014), *Trisetaria panicea* (Lam.) Paunero (Antwerp, 2015) and *Urochloa ramosa* (L.) T.Q. Nguyen (Antwerp, 2018) (wn.be).
- A taxon, doubtfully recorded by Pelgrims in the past (Hoste & Verloove 2019), was removed: *Eustachys retusa* (Lag.) Kunth.
- *Panicum* L.: an additional species was found as a casual alien, *P. coloratum* L. (Meeswijk, 1986; comm. T. Denters).
- *P. miliaceum* L.: the biostatus depends from the subspecies, subsp. *miliaceum* always being ephemeral. Contrary to what was assumed before, subsp. *ruderales* (Kitagawa) Tzvelev and subsp. *agricola* H. Scholz et Mikoláš hardly differ in ecology and habitat preference. Both occur as weeds of agricultural fields and as ruderals.
- *P. barbipulvinatum* Nash was segregated from *P. capillare* L. and treated in detail, following FG, H24, etc. (see also Amarell 2013, Dirkse & Holverda 2016).
- *P. chloroticum* Nees ex Trin. was reduced to a variety of *P. dichotomiflorum* Michaux, var. *chloroticum* (Nees ex Trin.) B. Bock.

Table 1. Name changes in Poaceae in NF7 as compared with NF6.

Name in NF6	New name in NF7
<i>Beckeropsis petiolaris</i> (Hochst.) Figari et De Not.	<i>Cenchrus petiolaris</i> (Hochst.) Morrone
<i>Leptochloa uninervia</i> (J. Presl.) Hitchc. et Chase	<i>Diplachne fusca</i> (L.) Beauv. ex Roem. et Schult. var. <i>uninervia</i> (J. Presl) P.M. Peterson et N. Snow
<i>Pennisetum alopecuroides</i> (L.) Spreng.	<i>Cenchrus purpurascens</i> Thunb.
<i>Pennisetum flaccidum</i> Griseb.	<i>Cenchrus flaccidus</i> (Griseb.) Morrone
<i>Pennisetum villosum</i> Fresen.	<i>Cenchrus longisetus</i> M. C. Johnst.
<i>Stipa tenuissima</i> Trin.	<i>Nassella tenuissima</i> (Trin.) Barkworth
<i>Panicum clandestinum</i> L.	<i>Dichanthelium clandestinum</i> (L.) Gould
<i>Piptatherum miliaceum</i> (L.) Coss.	<i>Oloptum miliaceum</i> (L.) Röser et Hamasha
<i>Trisetaria michelii</i> (Savi) D. Heller	<i>Avellinia festuoides</i> (Link) Valdés et H. Scholz
<i>Arundinaria spathacea</i> (Franch.) McClintock	<i>Thamnocalamus spathaceus</i> (Franch.) Soderstrom
<i>Sasaella ramosa</i> (Makino) Makino	<i>×Sasinaria ramosa</i> (Makino) Demoly

- An additional alien species of *Echinochloa* Beauv. has occasionally been recorded: *E. oryzicola* (Vasing.) Vasing (wn.be). *E. hispidula* (Retz.) Nees ex Royle was reduced to a variety of *E. crus-galli* (L.) Beauv., var. *hispidula* (Retz.) Honda (and it is likely even conspecific with var. *crus-galli*; Hoste & Verloove 2022). Distinguishing features for two frequently recorded but casual aliens, *E. esculenta* (A. Braun) H. Scholz and *E. frumentacea* Link, were added.
- A note in NF6, in which several varieties of *E. crus-galli* were described, was removed because these are of no taxonomic value. The variation of this species is endless and also partly depends on the habitat (ecotypes). Plants in wet locations tend to be stockier with overhanging, longer awned spikelets ('hispidula'). Also subsp. *spiralis* (Vasing.) Tzvelev may be nothing else than another ecotype, typical of dried out ponds and exposed river banks. There are also transitional forms to *E. colona* Link ('praticola') and even the separation from *E. esculenta* / *frumentacea* is not always straightforward. See also Hoste & Verloove (2022).
- *E. muricata* (Beauv.) Fernald: this species does not include two but three varieties: in addition to var. *muricata* (RR and ephemeral) and var. *microstachya* Wiegand (the most widespread variety) also var. *wiegandii* (Fassett) Mohlenbr. [syn.: *E. wiegandii* (Fassett) McNeill et Dore] (Hoste 2004, Bomble 2016b, Hoste & Verloove 2022). It is RR but possibly overlooked. All three varieties are keyed-out now.
- *Setaria verticillata* (L.) Beauv. var. *ambigua* (Guss.) Parl.: the taxonomic status remains debatable: in a recent monograph of the genus it is accepted as a distinct species (Morrone *et al.* 2014), whereas molecular data suggest that it does not differ from var. *verticillata* (Layton & Kellogg 2014).
- *S. viridis* (L.) Beauv.: this is the wild ancestor of *S. italica* (L.) Beauv. and both may be better combined in one species (as subspecies; cf. FG). Other recent Floras (Stace 2019, H24) do not do this, nor does the recent monograph of the genus (Morrone *et al.* 2014). The individual variation of *S. viridis* may be of little taxonomic importance. In addition to the varieties already mentioned in NF6, var. *weinmannii* (Roem. et Schult.) Heuffel. may be distinguished for plants with purple bristles.
- *S. italica*: according to some authors (FG) this species contains two taxa: plants with persistent caryopses, often drooping and lobed inflorescences and usually with bristles shorter than the spikelets belong to subsp. *italica*, while those with deciduous caryopses, often straight and barely lobed inflorescences and bristles usually longer than the spikelets could be referred to subsp. *moharia* (Alef.) R.A.W. Herrmann. Both are found in the Flora area.
- *S. faberi* R.A.W. Herrmann: the synonymy of this species with *S. macrocarpa* Lucznik was not questioned in a recent monograph of the genus (Morrone *et al.* 2014).
- An additional alien species of *Digitaria* Haller was recorded, *D. abyssinica* (A. Rich.) Stapf (Eksel, 2012; wn.be).
- *D. sanguinalis* (L.) Scop. var. *atricha* (Aschers. et Graebn.) Henrard: no recent Floras mention this taxon, since hair characteristics usually have little or no taxonomic value.
- *Eleusine indica* (L.) Gaertn. s.l.: it is still unclear which taxon / taxa exactly occur in the Flora area. According to our preliminary findings *E. africana* Kennedy-O'Byrne is the species usually recorded these days, whereas *E. indica* s.str. only occurred as an alien long ago. However, according to FG *E. indica* s.str. is the established species in France, while *E. africana* is an ephemeral alien. H24 only mentions *E. indica*, likely in a wide sense. In any case, these are better treated as separate species according to Peterson *et al.* (2015).
- *Spartina* Schreb.: according to some authors, this genus actually belongs in *Sporobolus* R. Brown now (Peterson *et al.* 2014) but there is a lot of opposition against these new insights (e.g. Bortolus *et al.* 2019). A conservative taxonomy is applied here but synonyms in *Sporobolus* were added (cf. H24).
- *S. anglica* C.E. Hubbard: this is better regarded as a separate species (neotaxon), originating from *S. ×townsendii* H. et J. Groves (FG, H24, Stace 2019). Both are now keyed out and treated as distinct entities.
- *Sporobolus indicus* (L.) R. Brown: this alien is recently naturalizing in the Flora area. The genus *Sporobolus* R. Brown and this species are keyed-out now and a full account is provided.
- Two additional alien species of *Eragrostis* Wolf were recorded (wn.be): *E. albensis* H. Scholz (Oostham, 2015) belongs to the *E. pilosa* group and is thus difficult to distinguish and possibly overlooked. It is increasing in the Netherlands and has also been recorded along river Moselle in the Trier area in Germany (FT), in both cases just outside the Flora area. The second new alien is *E. pectinacea* (Michaux) Nees (Antwerp port, 2012).
- *E. pilosa* (L.) Beauv. subsp. *damiensiana* (Bonnet) Thell. is now treated as a distinct species, *E. multicaulis* Steud.
- *Danthonia decumbens* (L.) DC. subsp. *decipiens* O. Schwarz et Bässler ex Bässler: this is a Central and eastern European taxon which presence in the Flora area was thought to be questionable (map Euro+Med Plantbase, FloraWeb; see also FG). However, it was recently found in two localities in the Trier area in Germany, in Eifel centr. and Lorr. nord-or. (FT, Schumacher 2013).
- An additional alien species of *Phalaris* L. was recorded, *P. angusta* Nees ex Trin. (Antwerp port, 2012; pers. obs.). A population of *P. aquatica* L., persisting in a ditch in Geel since 2008, consists of plants with hairy glumes. Such plants are sometimes classified as a separate species, *P. elongata* Br.-Bl. (e.g. Baldini 1995) although molecular

studies have shown that they are genetically not distinguished from *P. aquatica* (Voshell *et al.* 2015).

- ***Koeleria*** Pers.: this genus has hardly been sampled in molecular phylogenetic studies (Saarela *et al.* 2017). The three species found in the Flora area are morphologically similar and sometimes hard to tell apart. According to some authors they may be better understood as one variable species, *K. pyramidata* (Lam.) Beauv. (FG). However, according to Gregor *et al.* (2021) the relative DNA content of *K. macrantha* (Ledeb.) Schult. and *K. pyramidata* (Lam.) Beauv. is very clearly different. Pending further studies three distinct species are upheld.

- *K. glauca* (Spreng.) DC.: this species is sometimes grown as an ornamental and may be found as an escape. However, claims of it as a native species from the Flora area (see FLORAINE 2013) are doubtlessly erroneous (comm. S. Antoine 05.2021; compare also with FG).

- *K. albescens* DC. is a controversial name, as long as no (lecto-) type is chosen. The original material may partly belong to *K. macrantha* (Ledeb.) Schult. Therefore, the younger synonym *K. arenaria* (Dum.) B.D. Jacks. is now applied (FG).

- ***Rostraria cristata*** (L.) Tzvelev: this southern species is increasingly naturalizing in the Flora area, especially in urban habitats but also in coastal areas. The genus *Rostraria* Trin. and this species are keyed-out now and a full account is provided.

- ***Arrhenatherum elatius*** (L.) Beauv. ex J. et C. Presl subsp. *elatius* and subsp. *bulbosum* (Willd.) Schübl. et Martens: these subspecies are reportedly hybridizing. According to FG, such hybrids are much more common and increasing in some regions. Subsp. *bulbosum*, on the other hand, is indeed in regression, as indicated in NF6.

- ***Avenula*** (Dum.) Dum.: this genus now only includes *A. pubescens* (Huds.) Dum. in the Flora area, *A. pratensis* (L.) Dum. being transferred now to *Helictochloa* Romero Zarco, as *H. pratensis* (L.) Romero Zarco [the same applies to the introduced *H. bromoides* (Gouan) Romero Zarco].

- ***Deschampsia*** Beauv. now only includes *D. cespitosa* (L.) Beauv. in the Flora area, *D. flexuosa* (L.) Trin. and *D. setacea* now being transferred to *Avenella* (Bluff & Fingerh.) Drejer and *Aristavena* F. Albers et Butzin respectively [as *Avenella flexuosa* (L.) Drejer and *Aristavena setacea* (Huds.) F. Albers et Butzin].

- *D. cespitosa*: the infraspecific taxa already briefly mentioned in NF6 are now widely recognized, even as subspecies. The taxonomy and nomenclature were adjusted accordingly and now also correspond to e.g. FG and E+M Plantbase. Both subsp. *parviflora* (Thuill.) Dum. and subsp. *subtriflora* (Lag.) Ehr. Bayer et G. López [syn.: subsp. *convoluta* (Rouy) P. Fourn.] have been confirmed from northern France.

- ***Aira caryophyllea*** L. subsp. *multiculmis* (Dum.) Bonnier et Layens is now accepted as a distinct species, *A. multiculmis* Dum. (cf. FG).

- ***Elymus*** L. and ***Elytrigia*** Desv. are now treated as two distinct genera, following FG and particularly recent German authors (H. Scholz in E+M Plantbase), but this segregation remains controversial. In the Flora area *Elymus* only has one native representative, *E. caninus* (L.) L. The type of *Elytrigia* [*E. repens* (L.) Nevski], however, has the same genotype as *E. caninus*. A rare adventive species, *Elymus canadensis* L., also belongs in *Elymus* s.str.

- ***Elytrigia campestris*** (Godr. et Gren.) Kerguélen ex Carreras subsp. *maritima* (Tzvelev) H. Scholz: this taxon from coastal habitats was distinguished in NF6, differing from subsp. *campestris* by its inrolled leaves, even when fresh, with smooth or barely scabrous ribs (instead of more or less flat when fresh, with scabrous ribs), the spike 3-9 cm long (instead of 6-20 cm) and 2-6 flowered spikelets (instead of 3-10 flowered spikelets). However, it was demonstrated that such plants belong to either *E. acuta* (DC.) Tzvelev, *E. repens* (L.) Desv. ex Nevski or their hybrid (Wilcox 2012 and 2015a, Stace 2019, H24).

- An additional ***Secale*** was recorded as a casual grain alien, *S. ×derzhavinii* Tzvelev [*S. cereale* L. × *strictum* (C. Presl) C. Presl] (port of Antwerp, 2011-2013; wn.be).

- An additional alien ***Hordeum*** L. is sometimes observed, *H. murinum* L. subsp. *glaucum* (Steud.) Tzvelev (syn.: *H. glaucum* Steud.) (Verloove & Vercruyse 2020).

- Two subspecies are now distinguished and keyed out under *H. murinum*: native subsp. *murinum* and introduced, naturalized subsp. *leporinum* (Link) Arcang. (syn.: *H. leporinum* Link) (Verloove & Vercruyse 2020).

- ***Ammophila arenaria*** (L.) Link and ×***Calammophila baltica*** (Flügge ex Schrad.) Brand are now sometimes included in *Calamagrostis* Adans. (Saarela *et al.* 2017). Alternative names in this genus were added: *Calamagrostis arenaria* (L.) Roth and *C. ×calammophila* Saarela, respectively.

- A full account for a third species of ***Polygomon*** Desf., *P. maritimus* Willd., was added. It is increasingly found as an alien and has naturalized in a number of sand raised areas around Antwerp for over 20 years (Verloove *et al.* 2008).

- In the Mar. district, both in France (Gravelines) and in the Netherlands (Middelburg), plants intermediate between *P. monspeliensis* (L.) Desf. and *P. viridis* (Gouan) Breistr. have been recorded, occurring together or in the vicinity of these two species. They could be considered as belonging to the hybrid of these two species, *P. ×adscendens* Bertol. However, these plants are apparently very fertile and more likely belong to a morphologically ± intermediate species, *P. fugax* Nees ex Steud. In the Netherlands these plants were eventually considered to be indeed *P. fugax* (FZ, H24). The various genome weights of these three species (as provided by Zonneveld 2019) rather suggest that the intermediate plants are indeed a different species, *P. fugax*. The problem should be reconsidered.

- *Calamagrostis stricta* (Timm) Koeler: the use of this species name was controversial. Several databases and Floras (e.g. Digitale2, FG, E+M Plantbase) use the name *C. neglecta* for this species but this is a nom. illegit. according to Buttler (Florenliste). However, Sennikov (2022) reaffirmed the correct application of the name *C. neglecta* for this taxon.
- The binomial *Agrostis* × *sanionis* (Aschers. et Graebn.) Chase et Niles as indicated in NF6 for *A. capillaris* L. × *vinealis* Schreb., was removed since this name refers to the hybrid of *A. capillaris* × *canina* L. (Portal 2009).
- Several alien species of *Agrostis* L. are upheld in this genus, at least for the time being. *Agrostis*, *Lachnagrostis* Trin. and *Polypogon* form a clade and species of each are variously intermixed in plastid and nuclear ribosomal trees (Saarela *et al.* 2017). Their alternative names in *Lachnagrostis* were added: *Agrostis avenacea* J.F. Gmel. [syn.: *Lachnagrostis filiformis* (Forst.) Trin.], *A. eriantha* Hack. [syn.: *Lachnagrostis eriantha* (Hack.) A.J. Br.] and *A. lachnantha* Nees [syn.: *Lachnagrostis lachnantha* (Nees) Rúgolo et A.M. Molina].
- A species of *Agrostis* that is sometimes grown as an ornamental, *A. nebulosa* Boiss. et Reut., is now sometimes accommodated in a segregate genus; its alternative name in that genus was added, as a synonym [*Neoschischkinia nebulosa* (Boiss. et Reut.) Tzvelev].
- *A. stolonifera* L.: the correct name at varietal rank for a variety from salt meadows and brackish water edges is var. *arenaria* (Gouan) Dobignard et Portal. Var. *pseudopungens* (Lange) Kerguélen, also mentioned in NF6, is probably not distinguishable from it. Analogously, var. *palustris* (Huds.) Farw. likely is a mere hydromorphic form of var. *stolonifera* and of no taxonomic value (FG).
- An additional alien species of *Apera* Adans. was added, *A. intermedia* Hack. There are historical records (Verloove 2006) and it was also found in Ghent in 2013 (wn.be).
- An additional alien species of *Melica* L. was added, *M. altissima* L. It was seen as an escape in Sint-Stevens-Woluwe in 2020 (wn.be).
- *M. ciliata* L.: the wild populations that are found in the Flora area belong to subsp. *glauca* (F.W. Schultz) K. Richt., subsp. *ciliata* being mainly distributed in Central and Eastern Europe. The identity of plants found in the horticultural trade (and increasingly also as escapes) needs to be re-assessed; they may rather belong to subsp. *transilvanica* (Schur) Husn.
- *Brachypodium pinnatum* (L.) Beauv. and *B. rupestre* (Host) Roem. et Schult.: it remains completely unclear which species exactly occur in the Flora area. According to Digitale2 (see also Duluc 2019), in northwestern France only *B. rupestre* is found and AFL only mentions this species from French Lorraine. However, according to SI-Flore both occur in France in the Flora area. Moreover, in the Trier area in western Germany, adjacent to the Luxembourg part of Lorraine, *B. pinnatum* is considered to be the only native species, whereas *B. rupestre* is at most an introduction there (FT). In the Netherlands, only *B. pinnatum* s.str. occurs (H24). The issue must be thoroughly reinvestigated; for now and pending further studies nothing was changed.
- *B. phoenicoides* (L.) Roem. et Schult.: this thermophilous grass species was recently discovered in a few localities (e.g. Verloove & Barendse 2019). At least in two, it is established and it may have been overlooked elsewhere. It is now keyed-out and a full account is presented.
- *Dactylis glomerata* L.: is now accepted as a single variable species that also includes *D. polygama* Horvátovszky, now treated as subsp. *lobata* (Drejer) Lindb. f., following e.g. FG, H24, etc.
- The status and distribution of *D. glomerata* subsp. *lobata* is unclear in the Flora area. It is considered to be R in Lorraine. However, according to AFL the widespread subspecies there is subsp. *slovenica* (Domin) Domin, a taxon not previously reported from the Flora area. A local Red List (Bonassi 2015) only includes the latter while subsp. *lobata* is left unmentioned. According to FG, subsp. *lobata* is present in Alsace (thus further south) and in the Paris region whereas subsp. *slovenica* occurs in the east of France (but also in the NE?). Subsp. *lobata* is certainly present in calcicolous beech-oak-woodland in the Lorraine plateau (Côtes de Meuse et Moselle), e.g. in the Haye massif. It is globally rare but can locally be abundant (frequency index: AR-R). The genuine presence of subsp. *slovenica* in the Lorraine floristic district requires confirmation although its presence is highly probable there (comm. S. Antoine and J.-M. Tison, 01.2021). A record of the potential presence of subsp. *slovenica* in Lorr. was added, as were some morphological features that enable its separation from subsp. *lobata* and subsp. *glomerata*.
- Two annual species of *Poa* L., *P. annua* L. and *P. infirma* Kunth, are sometimes accommodated in a segregate genus, *Ochlopoa* (Aschers. et Graebn.) H. Scholz (e.g. E+M Plantbase). Synonyms in this genus were added: *O. annua* (L.) H. Scholz and *O. infirma* (Kunth) H. Scholz, respectively.
- A recently naturalized (or previously overlooked?) species of *Poa*, *P. infirma*, was added to the identification key and a full account provided (Verloove *et al.* 2020a; see also H24). It is mostly found in Mar. and Fl. in Belgium and the Netherlands. It is also known around Paris (FG) but just south of the Flora area (valley of the Seine; Digitale2).
- At subspecies rank, the correct name for *Poa pratensis* L. subsp. *latifolia* (Weihe) Schübl. et Martens is subsp. *irrigata* (Lindm.) Lindb. f.
- *Bromus* L. is now segregated and includes four distinct genera: *Bromus* s.str., *Bromopsis* (Dum.) Fourr., *Anisantha* K. Koch and *Ceratochloa* DC. et Beauv., following recent insights (see also FG, H24, Stace 2019).

- Some additional casual alien taxa of *Bromus* have been recorded: *B. intermedius* Guss. (Berchem, 1952). *B. japonicus* Thunb. in fact includes three subspecies in the Flora area: subsp. *japonicus* (the least rare taxon, seen most years), subsp. *phrygius* (Boiss.) Pénzes (Antwerp port, 2013) and subsp. *subsquarrosus* (Borbás) Pénzes (scattered records in port areas from 2009 onwards; pers. obs.).
- *B. arvensis* L.: this is a variable species. Subsp. *parviflorus* (Desf.) H. Scholz, with much shorter anthers up to 2 mm long, was observed in northeastern Lorr. (Germany; FT) and could exist elsewhere.
- *B. racemosus* L. and *B. commutatus* Schrad.: these two species are sometimes difficult to separate. According to Stace (2019), both can better be regarded as synonyms. In Belgium (and doubtlessly elsewhere too), plants have been observed with intermediate character states, suggesting hybridization or introgression, even though hybrids were not confirmed by Stace (2010). According to U. Amarell (comm. 11.2018) crosses in *Bromus* are fertile which further complicates the issue. It has been suggested that allopolyploid speciation may be involved (comm. H. Baeté, 05.2017). Weak species boundaries are a known phenomenon in *Bromus*. See also the interesting discussion in FG (p. 217). From this point of view, only three genuine, ‘biological species’ are present in Belgium: *B. arvensis*, *B. hordeaceus* L. and *B. secalinus* L., all the others having evolved from them.
- *B. commutatus* includes two subspecies in the Flora area: subsp. *commutatus* and subsp. *decipiens* (Bomble et H. Scholz) H. Scholz. Both are now keyed-out. The latter was initially described as a subspecies of *B. secalinus* L. and treated as such in NF6. It is more or less intermediate between these two species, underscoring the taxonomic difficulties in this complex.
- *B. bromoideus* (Lej.) Crépin: although morphologically quite distinct, this species is probably only a monogenetic mutant of *B. grossus* Desf. ex DC. Therefore, it was included in the synonymy of the latter in FG. However, taking into account the clear and constant morphological and genetic differences as compared to *B. grossus*, it was upheld (see also Koch *et al.* 2016, Godefroid *et al.* 2020).
- *B. hordeaceus* L.: this species includes two native subspecies in the Flora area: subsp. *hordeaceus* and subsp. *thominei* (Hardouin) Br.-Bl. A third subspecies, subsp. *pseudothominei* (P.M. Smith) H. Scholz is now accepted as a distinct, hybridogenous species, *B. pseudothominei* P.M. Smith (FG, Stace 2019). If this were upheld as a subspecies of *B. hordeaceus*, then the other parental species, *B. lepidus* Holmberg, should also be regarded as a subspecies of it. An additional subspecies has also been recorded, subsp. *longipedicellatus* L.M. Spalton. It is separated by some authors (FG, Stace 2019) but not by others (H24). These are very robust plants (stem up to 150 cm high) with a panicle over 12 cm long, with at least four panicle branches 15 mm or longer.
- The identity of a plant sown for the revegetation of a slag heap in Brab. occ. (France) should be reassessed. It was originally assigned to *Bromopsis pumpelliana* (Scribn.) Holub. (syn.: *Bromus pumpellianus* Scribn.) (Verloove 2008a), then to *B. riparia* (Rehm.) Holub (syn.: *Bromus riparius* Rehm.) (FG). These plants are more or less intermediate between *B. inermis* (Leyss.) Holub and *B. erecta* (Huds.) Fourr. and could also exist elsewhere in the Flora area.
- Two subspecies of *B. ramosa* (Huds.) Holub, subsp. *ramosa* and subsp. *benekenii* (Lange) Schinz et Thell., are now accepted as two distinct species, following recent insights (FG, Stace 2019; see, however, H24): *B. ramosa* s.str. and *B. benekenii* (Lange) Holub.
- *Anisantha diandra* (Roth) Tutin ex Tzvelev: this species included two subspecies in NF6. These are now accepted as two distinct species, *A. diandra* s.str. and *A. rigida* (Roth) Hyl., following recent insights (FG, Stace 2019; see, however, H24).
- *A. madritensis* (L.) Nevski is locally naturalized now in the Flora area. The species is keyed-out and a full account provided.
- *Ceratochloa carinata* complex: the established plants belong to *C. sitchensis* (Trin.) Cope et Ryves, not to *C. carinata* (Hook. et Arnott) Tutin s.str. (Verloove 2012a). See also FG, H24, etc. The latter is very close to and has often been confused with *C. sitchensis*. It is rarely seen as an ephemeral alien and differs by its smaller spikelets, grouped in a short, compact panicle.
- *Glyceria striata* (Lam.) A.S. Hitchc.: this American weed in fact includes two subspecies in the Flora area. The invasive plant belongs to subsp. *difformis* Portal: plants with spreading inflorescences with more or less inclined branches, with spikelets 2-2.5(-3) mm long, with 2-3 flowers, with lemmas 1.2-1.8 mm long and with upper glumes 0.7-0.8 mm long. In subsp. *striata*, which is hardly invasive, the inflorescence is distinctly one-sided with pendulous branches, the spikelets are (2.5-)3.5-5 mm long, 3-5-flowered, the lemmas are 2-2.4 mm long and the upper glumes 1-1.3 mm long. The distribution of these subspecies in the Flora area should be verified; however, most populations belong to subsp. *difformis*, including those found in Belgium (see also Vernier 2015 and Saint-Val 2018 with respect to populations found in French Lorraine). According to FLORAINE (2013) both subspecies are present in Lorr.
- *Puccinellia rupestris* (With.) Fernald et Weath. is now accommodated in a separate genus as *Pseudosclerochloa rupestris* (With.) Tzvelev, following e.g. Portal (2014) and FG.
- *Vulpia* C.C. Gmel. now also includes *Nardurus maritimus* (L.) Murb. [as *V. unilateralis* (L.) Stace].
- The generic circumscription of *Festuca* L. has dramatically changed. Three broad-leaved species with auriculate leaf blades are now accommodated in a segregate genus,

Schedonorus Beauv. As a result, intergeneric hybrids between these species and *Lolium* L. (formerly named \times *Festulium* Aschers. et Graebn.) are now placed in \times *Schedolium* Holub. A fourth species of *Festuca*, *F. altissima* All., now belongs in another segregate, *Drymochloa* Holub. This renewed classification better reflects the natural relationships between the species of these genera and is in accordance with other recent western European Floras (FG, H24, Stace 2019). However, even then further studies are needed. Preliminary molecular studies have suggested to merge *Vulpia* and *Festuca* (Soreng *et al.* 2015). Also, *Schedonorus* has been included in *Lolium* by some authors (see Banfi *et al.* 2017 for an overview).

- The genus *Festuca* remains very poorly known, not only with respect to native species but also with regard to cultivated and escaped taxa. In addition to those briefly mentioned, several others are applied for various purposes (e.g. as ornamentals but also for revegetation and landscaping). Some recent publications may be of use to help solving this issue, e.g. Englmaier (2009) and Englmaier & Münch (2020). Interestingly, most plants labelled ‘*Festuca glauca*’ in the horticultural trade, including popular cultivars such as ‘Elijah Blue’, belong to *F. cinerea* Vill. instead (Englmaier & Münch l.c.). It is very unlikely that genuine *F. glauca* Vill., as mentioned in NF6, occurs in Belgium, either as an ornamental or as an escape.

- In NF6, reference was made to the existence of hybrids between species of *Festuca*. These, however, referred to species that are now placed in segregate genera like *Schedonorus* P. Beauv. Hybrids in *Festuca* s.str. are probably very exceptional (none were mentioned, for instance, by Stace *et al.* 2015) but not impossible (see e.g. Malik 2011).

- The taxonomy of the *F. rubra* group was completely revised and is now in agreement with that of FG. This means that subsp. *commutata* (Gaudin) Markgr.-Dann., subsp. *fallax* (Thuill.) Nyman and subsp. *arenaria* (Osbeck) Aresch. are now accepted as distinct species, respectively *F. nigrescens* Lam., *F. heteromalla* Pourr. and *F. arenaria* Osbeck. *F. rubra* L. s.str. is still represented by three subspecies in the Flora area: subsp. *rubra*, subsp. *litoralis* (G.F.W. Mey.) Auquier and subsp. *juncea* (Hack.) K. Richt. The latter also includes subsp. *pruinosa* (Hack.) Piper., previously distinguished in NF6 for pruinose plants from coastal habitats.

- A further species from the *F. rubra* group was recently discovered in the southeastern part of the Flora area, where it may have been overlooked in the past: *F. trichophylla* (Ducros ex Gaudin) K. Richt. [syn.: *F. rubra* L. subsp. *trichophylla* (Ducros ex Gaudin) Hegi]. Its leaves are very narrow (0.3-0.6 mm across) and scabrous, at least towards the apex. However, it is mainly characterized by the median sclerenchyma bundle which is clearly more developed than the (sub-)marginal ones (FG). It was added to the key and a full account is presented.

- The taxonomy of the *F. ovina* complex remains very controversial. For convenience and in the absence of a

better alternative, the taxonomic framework already applied in NF6 was maintained (it is also in agreement with that applied in FG). Dengler (2000) proposed a different scheme that was also followed in H24. *F. ovina* L. s.str. probably does not occur in the Flora area although morphologically similar plants have been reported, at least historically, from Belgium (Ronse & Arndt 2014) and the Netherlands (Haveman 2015). It is a predominantly Central-European species that has also been reported from northeastern France (FG). However, recent genetic analyses have demonstrated that Alsace populations of alleged *F. ovina* subsp. *ovina* (diploids as well as autotetraploids) are very distant from *F. ovina* subsp. *ovina* of Central-Europe (comm. R. Boeuf 02.2021).

Dengler (2000) attributed plants from zinciferous soils to *F. guestfalica* Boenningh. ex Reichenb. subsp. *guestfalica* [including subsp. *calaminaria* (Auquier) Dengler, the latter only being an ecotype without taxonomic value; in fact, *F. guestfalica* is found on a wide range of soil types]. In the Flora area, the latter [as *F. ovina* subsp. *guestfalica* (Boenningh. ex Reichenb.) K. Richt.] is considered to be a strictly zinciferous taxon, only found in a small area in Mosan or. (i.e., valleys of rivers Vesdre and Gueule in Belgium and the Netherlands, as well as in the Aachen region in adjacent parts of Germany). This, however, may be a serious underestimation of its genuine distribution in the Flora area, based solely on plants found on zinciferous soils (‘subsp. *calaminaria*’). In reality, subsp. *guestfalica* is possibly more widespread although assessing its distribution requires additional research. Whereas in Belgium it may indeed be (mostly) confined to zinciferous soils, in neighboring territories it also occurs on other substrates. It is widespread in Lorraine in northeastern France (SI-Flore) but, at present, probably only beyond the limits of the Flora area. However, further French records near Givet, Charleville-Mézières and Reims (respectively in Mosan, Ard. and Champ. districts) indicate that this taxon may be more widespread and should be looked for elsewhere. For instance, its presence is also likely in Boul. (see below). In the Trier area in Germany (FT) *F. guestfalica* is said to be the most common representative of the *F. ovina* complex but these authors include *F. lemanii* Bast. and *F. heteropachys* (St-Yves) Patzke ex Auquier in this species, the former indeed being relatively frequent in Eifel centr. (AC-AR). An additional difficulty is that not all plants ascribed to subsp. *guestfalica* in northeastern France indeed correspond to that taxon (comm. R. Boeuf 02.2021). In many instances the descriptions of the taxon in use in the main Floras are quite different from those used by Wilkinson & Stace (1987) who typified the species. These authors already said that “the plants from France thought of as possible *F. guestfalica* by Kerguelen are not good matches for the type material, and we have seen no material of *F. guestfalica* from France, Belgium or Holland”. It appears that the binomial *F. guestfalica* often has wrongly been applied.

A third subspecies of *F. ovina*, subsp. *hirtula* (Hack. ex Travis) M.J. Wilkinson, is also subsumed under this species by Dengler (2000), as *F. guestfalica* subsp. *hirtula* (Hack. ex Travis) Dengler. The taxonomic value of this taxon is not acknowledged by all authors (e.g. FG). It usually is, like subsp. *ovina*, confined to acid soils (Stace 2019). Hence, its alleged presence in Boul. (as per NF6) is questionable. These populations are actually referred to *F. ovina* subsp. *guestfalica* in Digitale2. Genuine subsp. *hirtula*, however, also occurs in the Flora area: it is found in quantity in decalcified dunes near Ostend in Belgium (although its status is unclear there: it may well be an old introduction since the population is found where once was a horse racing venue; comm. M. Leten, 2015).

- *F. heteropachys* (St-Yves) Patzke ex Auquier: this is a poorly known species that was recently additionally characterized by Boeuf (2018). The identity of populations found in the Flora area requires further study. According to Jauzein & Nawrot (2011), tetraploid *F. heteropachys* from Île de France refers to *F. ovina* subsp. *guestfalica*. *F. heteropachys* s.str., as originally defined by Saint-Yves, is a hexaploid (6x) and hairless taxon, as can be seen in the Alsace in the area of the *locus typicus* (comm. R. Boeuf 02 and 12.2021). Still according to R. Boeuf, *F. heteropachys* as accepted by Auquier (1974; and thus also referable to populations found in Belgium) partly refers to *F. guestfalica* (as per Jauzein & Nawrot l.c.) and partly to a hairy, tetraploid 'form' of *F. heteropachys*. In the Flora area, the latter is indeed said to have distinctly hairy leaf sheaths and leaf bases, suggesting that this hairy, tetraploid 'race' is the usual taxon encountered. In fact, all things considered, it represents a distinct species, with main distribution in the Ardennes, that will be described in due time as *F. arduennensis* R. Boeuf et Tison (comm. R. Boeuf 12.2021). All populations, however, should be critically revised and at least part of them thus refer to *F. ovina* subsp. *guestfalica*.

- In NF6, *F. lemanii* Bast. was said to sometimes occur in morphologically diverse populations, including pruinose and non-pruinose individuals. However, *F. lemanii* is a non-pruinose species and pruinose plants in such populations probably refer to other taxa (FG), incl. *F. ovina* subsp. *guestfalica*.

- An enigmatic species similar to *F. marginata* (Hack.) K. Richt. is worth mentioning: *F. costei* (St-Yves) Markgr.-Dann. Both are pruinose fescues with glaucous foliage and smooth, very narrow leaves. It was already discussed by Auquier (1969) and is known to be present at least in Lorr. in the Grand-Duchy of Luxembourg. In the past decades this taxon was widely neglected although according to new insights it may merit taxonomic recognition, even at species rank (comm. R. Boeuf 02.2021). In leaf section it clearly differs from *F. marginata* and *F. patzkei* Markgr.-Dann: leaves are V-shaped in section, (0.7-)0.9-1.3(-1.8) mm wide with the sclerenchyma generally in three decurrent islets, (1-)2-3(-4) ridges, 7-9(-13) bundles and (2-)3(-4) convex ribs.

- The species called *F. longifolia* Thuill. subsp. *pseudocostei* Auquier et Kerguelen in NF6 is now accepted as a distinct species, *F. patzkei* Markgr.-Dann.

- *Schedonorus arundinaceus* (Schreb.) Dum.: this is a very variable species that also includes cultivars. It is uncertain if the application of infraspecific taxa as proposed in NF6 is correct. For instance, do some of our plants genuinely belong to subsp. *asperus* (see also FG)? Similarly, the presence of subsp. *mediterraneus* (Hack.) H. Scholz et Valdés in northwestern France also appears to be highly unlikely. At least, this claim is not confirmed, neither by Digitale2 nor by SI-Flore, and may merely refer to xeromorphs of *S. arundinaceus* (FG). In reality, subsp. *mediterraneus* has a limited distribution area in the southwestern Mediterranean area (e.g. Devesa *et al.* 2019).

- A binomial was added for the intergeneric hybrid *Schedonorus arundinaceus* × *Lolium multiflorum*: ×*Schedonium krasanii* H. Scholz (Scholz 2007).

62. Ceratophyllaceae

- *Ceratophyllum platyacanthum* Cham. [syn.: *C. demersum* L. var. *platyacanthum* (Cham.) Wimmer]: this taxon was formerly recorded in the Nancy area in Lorr., as an ephemeral according to FG. Based on phylogenetic molecular studies this is probably a recently diverged polyploid lineage of *C. demersum* (Szalontai *et al.* 2018).

63. Papaveraceae

- Recent molecular studies (e.g. Xiao & Simpson 2017) have placed *Meconopsis cambrica* (L.) Vig. in *Papaver* L. again, the genus in which the species was originally described (as *Papaver cambricum* L.). This was not yet followed (contrary to FG, H24) but the synonym was added.

- An additional species of *Glaucium* Mill. was recorded as a casual alien, *G. grandiflorum* Boiss. et A. Huet (Ghent, 2016; wn.be).

- Two additional species of *Papaver* L. have been recorded: *P. commutatum* Fisch. et C.A. Mey. (a few records since 2015, as grain alien or garden escape; wn.be) and *P. nudicaule* L. (a garden escape in 2014 in Ghent; wn.be).

- The exact boundaries of the genus *Papaver* L. remain uncertain. According to recent molecular phylogenetic studies (e.g. Carolan *et al.* 2006) some species (notably *P. argemone* L. and *P. hybridum* L.) should be transferred to the genus *Roemeria* Moench or - alternatively - *Roemeria* included in *Papaver*. The same studies also include *Mecconopsis cambrica* in the genus *Papaver*. Pending additional studies, a more conservative taxonomy was adopted but synonyms in *Roemeria* are added for the two *Papaver* species involved [respectively *Roemeria argemone* (L.) Morales *et al.* and *R. hispida* Stace].

- *P. dubium* L.: some authors, especially in Central-European countries, distinguish a third subspecies, subsp. *confine* (Jord.) Hörandl (syn.: *P. confine* Jord.). It is little known but probably mainly distributed in Central Europe (although originally described from France). Its latex is

white like that of subsp. *dubium*, but drying reddish like that of subsp. *lecoqii* (Lamotte) Syme. In addition, its basal leaves are quite roughly divided with rounded sections, usually green or only slightly glaucous. This subspecies has been recorded in Ard. and northeastern Lorr. (Belgium, Germany) (FT, Bomble & Jagel 2016, Remacle 2021) and should be sought elsewhere in the territory of the Flora, especially in its eastern part.

- Two species of *Corydalis* DC. have been recorded as aliens recently: *C. cheilanthifolia* Hemsl. (Genk, 2013-2014; wn.be) and *C. linstowiana* Fedde (Verloove & Devos 2021).

- *Fumaria muralis* Sond. ex Koch: this is a very variable species, especially with regard to the size of flowers and fruits. The plants usually observed in the territory of the Flora have been reported to subsp. *boraei* (Jord.) Pugsley with flowers 10-12 mm long and fruits 2.25-2.5 mm long and 2 mm wide. However, at least some plants have smaller flowers and fruits. The taxonomic value of the different subspecies is low (FG, Stace 2019) and they are linked by intermediates. In addition, according to some authors the amalgamation of *F. muralis* with *F. reuteri* Boiss. and *F. bastardii* Boreau would be desirable (Jauzein 1995). Plants probably belonging to the latter, with shorter lower raceme peduncles (15-22 mm), have been observed as a garden weed in Aublain (Mosan) (comm. S. Carboneille, 2017). A more profound study of the complex in the Flora area is needed.

- *F. officinalis* L.: the taxonomic value of the subspecies distinguished in NF6 is probably weak (FG; see also Remacle 2020).

64. Lardizabalaceae

- This new family was added. In the Flora area, it is represented by two ornamentals that have been recorded as escapes from cultivation, *Akebia quinata* (Houtt.) Decne. (scattered records since 2009) and *Decaisnea insignis* (Griff.) Hook. f. et Thomson Thomson (a few records since 2015) (wn.be).

65. Berberidaceae

- An additional species of *Epimedium* L. has been recorded as an escape from cultivation, *E. pinnatum* Fisch. ex DC. (Barvaux, 2012; wn.be).

- As currently understood, *Berberis* L. includes *Mahonia* Nutt. (Kim *et al.* 2004). The latter was merely distinguished by pinnate leaves and the absence of spines. Its separation was essentially artificial and chiefly maintained by horticulturists. The existence of artificial intergeneric hybrids also suggested their close relationship. However, merging both genera remains controversial. Yu & Chung (2017) – based on new molecular evidence – proposed a new classification of *Berberis* s.l. by applying a strict definition of *Berberis* (i.e., *Berberis* s.str.), reinstating *Mahonia* (i.e., core *Mahonia*) (see also Hsieh *et al.* 2022).

- Several additional species of *Berberis* have been observed recently as (usually) ephemeral escapes from cultivation: *B. darwinii* Hook., *B. ×hybrido-gagnepainii* J.V. Suringar, *B. ×interposita* Ahrendt and *B. wilsoniae* Hemsl. (wn.be). The same applies to *B. japonica* (Thunb.) R. Br. [syn.: *Mahonia japonica* (Thunb.) DC.] and/or hybrids of it with *B. bealei* Fortune (wn.be).

66. Ranunculaceae

- Recent molecular studies have demonstrated that *Consolida* S.F. Gray is embedded in *Delphinium* L. (Jabbour & Renner 2010, 2011, 2012).

- Molecular studies have dramatically changed the generic boundaries of *Anemone* L. Several widely accepted genera like *Hepatica* Mill. and *Pulsatilla* Mill. were shown to be part of it (e.g. Hoot *et al.* 1994, Ehrendorfer & Samuel 2001, Schuettelpelz *et al.* 2002, Hoot *et al.* 2012). Two species, *Hepatica nobilis* Schreb. and *Pulsatilla vulgaris* Mill., were transferred to *Anemone* again, the genus in which they were originally described, as *A. hepatica* L. and *A. pulsatilla* L. respectively.

- *A. blanda* Schott et Kotschy: this ornamental is increasingly observed as an escape and could be confused with the similar-looking *A. apennina* L. It differs from the latter by sepals that are glabrous on the lower side and pendent heads at maturity.

- An additional species of *Clematis* L. has been observed as an escape: *C. montana* Buch.-Ham. ex DC. This species persists with few individuals on a brick quay of river Leie in Kortrijk since 2014 (wn.be).

- As a result of recent molecular phylogenetic studies the boundaries of *Ranunculus* L. have slightly changed and these changes partly affect western European taxa. The native species *Ranunculus ficaria* L. now belongs in the segregate genus *Ficaria* Guett. (as *F. verna* Huds.) (Emadzade *et al.* 2010).

- *Ranunculus auricomus* L.: since Demarsin (1968), nothing substantial has been investigated in the Flora area in this species complex. The subspecies described from Belgium were all given species rank by Ericsson (1992): *R. sparsipubescens* (Demarsin) Ericsson, *R. monticola* (Demarsin) Ericsson, *R. scaldianus* (Demarsin) Ericsson, *R. hannonianus* (Demarsin) Ericsson, *R. mosanus* (Demarsin) Ericsson, *R. lawalreei* (Demarsin) Ericsson, *R. crassicaulis* (Demarsin) Ericsson, *R. delvosallei* (Demarsin) Ericsson, *R. brabantianus* (Demarsin) Ericsson, *R. baguetii* (Demarsin) Ericsson and *R. vanneronii* (Demarsin) Ericsson. *R. auricomus* subsp. *grandiflorus* Demarsin became *R. demarsinii* Ericsson and *R. auricomus* subsp. *incrassatus* Demarsin became *R. pachyphyton* Ericsson. From the western part of Germany and adjacent areas, Schmelzer (2016) newly described several species that also occur in the Flora area: *R. abyssus* Schmelzer (Grand Duchy of Luxembourg), *R. arundinoides* Schmelzer (Germany), *R. arundo* Schmelzer and *R. compositus* Schmelzer (Eifel centr.), *R. eifeliensis* Schmelzer (Eifel

centr.), *R. geraniifolius* Schmelzer (also Belgium: Voeren, Eupen), *R. lommersdorfensis* Schmelzer (Eifel centr.) and *R. meckelensis* Schmelzer (Eifel centr.). All these names, however, are provisional and need to be formally published.

In the absence of support from molecular studies, recent Floras from neighboring territories, such as H24, FG and Stace (2019), pay no attention to the (facultative) apomictic ‘species’ from the *R. auricomus* complex.

- *R. serpens* complex: two extreme forms of this species complex were treated as subspecies in NF6 (also in H24, as subspecies of *R. polyanthemus* L.) but other recent Floras tend to accept them as distinct species, e.g. FG, a point of view that was followed (*R. serpens* Schrank s.str. and *R. polyanthemoides* Boreau). The possible presence of a third species from this complex in the Flora area, *R. polyanthemophyllus* W. Koch et H. Hess, was recently confirmed. It occurs in several places in Eifel centr. (FT; determinations confirmed by M. Baltisberger, expert of the group). However, according to FG the taxonomic value of this species (and others from this complex, e.g. *R. tuberosus* Lapeyr.) is probably weak, with certain individuals or populations showing character states of two or even three ‘species’. Additional studies are needed.

- *R. baudotii* Godr.: this species was subsumed under *R. peltatus* Schrank in FG, as subsp. *baudotii* (Godr.) Meikle ex C. Cook. However, according to Zalewska-Gałosz *et al.* (2015) it is genetically closer to *R. fluitans* Lam. than to *R. peltatus* (see also Wiegleb *et al.* 2017, Wiegleb 2020). It was thus maintained as a distinct species, pending further studies.

- *R. penicillatus* (Dum.) Bab. subsp. *pseudofluitans* (Syme) R. Webster: morphological and preliminary genetic data, as well as its general distribution and ecology, suggest a hybridogenous origin (*R. fluitans* × *circinatus* Sibth.) (Wiegleb 2020). It is perhaps better treated as a distinct species (Wiegleb *et al.* 2017), as was done in H24.

- Moreover, a very similar species – native to the entire western Europe, though scattered in occurrence – probably has been overlooked: *R. vertumnus* (C.D.K. Cook) Lufertov [syn.: *R. penicillatus* var. *vertumnus* C.D.K. Cook; *R. penicillatus* subsp. *pseudofluitans* var. *vertumnus* (C.D.K. Cook) S.D. Webster] (Wiegleb *et al.* 2017). It differs from *R. pseudofluitans* by the short mostly flaccid leaves with a higher number of final segments. It is of hybridogenous origin and shows affinities to both *R. trichophyllus* Chaix and *R. aquatilis* L. It should be looked for in the Flora area, in alkaline rivers and streams.

- A species very similar to *Thalictrum flavum* L., *T. speciosissimum* L. [syn.: *T. flavum* subsp. *glaucum* (Desf.) Battand.], is cultivated for ornament and occasionally observed as an escape (wn.be). It differs from *T. flavum* by its glaucous leaves with very prominent veins on the lower side.

- *T. minus* L.: FLORAINE (2013) mentions three subspecies for Lorr.: subsp. *minus*, subsp. *majus* (Crantz) Hook.

f. and subsp. *saxatile* Ces. but this view is not shared by FG and Vernier (2020). Subsp. *majus* occupies a small area in south-eastern Central Europe, whereas the westernmost (and very disjunct) populations of subsp. *minus* are located near Mainz in Germany (Hand 2020).

69. Paeoniaceae

- In addition to *Paeonia officinalis* L., a second species is occasionally observed as an escape from cultivation, *P. lactiflora* Pallas (wn.be).

72. Grossulariaceae

- Two frequently cultivated ornamentals that have locally naturalized, *Ribes aureum* Pursh and *R. sanguineum* Pursh, are now added to the key and full accounts are presented.

- *R. aureum* Pursh: this species is quite variable. Cultivated and subsponaneous plants mainly correspond with var. *villosum* DC. (syn.: *R. odoratum* H.L. Wendl.) with a longer flower tube and young branches that are more or less pubescent (Morin 2009). However, the distinction from var. *aureum* seems to be weak. Therefore, the name *R. aureum* is applied, rather than *R. odoratum*, contrary to e.g. FG and H24.

- *R. rubrum* L.: cultivated and escaped plants of this species are often cultivars that are merely derived from *R. rubrum* (rather than representing the genuine species) and/or complex hybrids with related species such as *R. multiflorum* Roem. et Schult., *R. petraeum* Wulfen and *R. spicatum* E. Robson (see also FG, H24).

73. Saxifragaceae

- Many Saxifragaceae are cultivated for ornament in parks and gardens. In addition to those already mentioned in NF6, a few others have been recorded recently as escapes from cultivation: *Darmera peltata* (Torrey ex Benth.) Voss (observed in several localities, since 2011) and *Tiarella cordifolia* L. (exceptionally seen, since 2012) (wn.be).

- Another ornamental, *Tellima grandiflora* (Pursh) Dougl. ex Lindl., is now fully naturalized in several parts of the Flora area. It was included in the key and a full account presented.

74. Crassulaceae

- *Sempervivum funckii* F. Braun ex Koch var. *aqualiense* E. Morren: a recent karyological study showed that this taxon is of hybrid origin, but the putative parental species have yet to be identified to clarify its taxonomic status (*S. funckii* itself is a triple hybrid of *S. arachnoideum* L. × *montanum* L. × *tectorum* L. parentage). It is not known if the population is of horticultural origin or if it is a mid-European relic (Van Rossum *et al.* 2017).

- The generic circumscription of *Sedum* L. has considerably changed, as a result of molecular phylogenetic studies (numerous references, e.g. Mort *et al.* 2001, Gontcharova & Gontcharov 2009, Lim & Choi 2018). For species present in the Flora area, this means that species related to *S.*

telephium L. are now accommodated in the segregate genus *Hylotelephium* Ohba and flat-leaved species related to *S. spurium* M. Bieb. are now placed in *Phedimus* Raf.

- Two additional ornamental species of *Sedum* have been recorded as escapes from cultivation: *S. palmeri* S. Watson (known from a single locality, in Chokier, since 2018; wn.be) and *S. spathulifolium* Hook. (occasionally observed since 2019, often in cemeteries; wn.be).

- *S. album* L.: several very similar species are cultivated for ornament (especially green roofs, cemeteries), the identity of which remains to be confirmed. Probably at least *S. lydium* Boiss. and *S. pallidum* Bieb. are involved. These species are distinguished from *S. album* by the shorter petals (barely twice as long as the tepals) and more pauciflorous inflorescences. They easily escape and are sometimes seen near plantations.

- *S. rupestre* L.: a similar species, *S. sediforme* (Jacq.) Pau (syn.: *S. altissimum* Poir.), is sometimes cultivated for ornament and has been observed as an escape in an old quarry in Ampsin (Mosan), since at least 2013 (and occasionally elsewhere as well). This species is distinguished by its yellow-whitish petals and the absence of bracts in the inflorescence.

- *S. sarmentosum* Bunge: this Asian ornamental has now naturalized in the Flora area: it was added to the key and a full account was provided.

- *Hylotelephium telephium* (L.) Ohba: the taxonomic value of the two subspecies that are keyed out in NF6 [subsp. *telephium* and subsp. *fabaria* (Koch) Ohba] is probably weak (they are not accepted in most other contemporary Floras, e.g. FG, H24, Stace 2019). Their geographical distribution needs to be reviewed after finalization of this taxonomic problem. In addition, it is possible that plants exhibiting the characteristics of subsp. *fabaria* simply belong to the variation of *H. telephium* and do not correspond exactly to the plants described by Koch from the Sudetenland (FT). A third subspecies that was referred to in NF6 is probably better accepted as a distinct species, *H. maximum* (L.) Holub (FG, contrary to H24), but – at least to our current knowledge – it only occurs in the wild just outside the Flora area, in the Netherlands.

- Two species of *Phedimus* Raf., other than those treated in detail, have occasionally been recorded as ephemeral escapes from cultivation: *P. aizoon* (L.) 't Hart (syn.: *Sedum aizoon* L.) and *P. stolonifer* (J.F. Gmel.) 't Hart (syn.: *S. stoloniferum* J.F. Gmel.) (since 2012 and 2011 respectively; wn.be).

- *P. kamtschaticus* (Fisch. et C.A. Mey.) 't Hart: in NF6, the plants usually found in cultivation (and escapes) were referred to subsp. *ellacombeanum* (Praeger) R.T. Clausen. Other contemporary Floras, e.g. H24 and Stace (2019), attribute the escaped plants to other infraspecific taxa, especially to 'middendorffianus'. In reality, and doubtlessly as a result of long cultivation and selection, the plants from this complex are difficult to name and therefore only the species (without infraspecific taxa) was upheld.

75. Haloragaceae

- *Myriophyllum aquaticum* (Velloso) Verdc.: this species was placed on the EU list of prohibited invasive alien species in 2016. Subsequently, a similar but smaller aquatic plant was increasingly offered for sale in the horticultural trade, as an alternative, under the trade name *Myriophyllum* 'Brasiliensis' or *Myriophyllum* 'Red Stem'. Both morphologically and genetically, the latter and *M. aquaticum* can be easily distinguished: the emerged stems are red (vs. green for *M. aquaticum*), leaves are green (vs. glaucous) and flowers are pink (vs. white). The origin of this plant is unclear but it was recently described as a species new to science, *M. rubricaula* Valk. et Duist. (van Valkenburg *et al.* 2022). A critical reassessment of records of *M. aquaticum* demonstrated that this unknown species has already been present in the wild in the Flora area since at least 2012 (wn.be). Its presence was since then confirmed in Fl., Camp., Brab. and Ard. (wn.be).

- In NF6, *M. aquaticum* was said to be solely known in the vegetative state in the Flora area. This, however, no longer applies.

76. Vitaceae

- An additional species from a new genus is grown as an ornamental and has been recorded as an escape: *Ampelopsis glandulosa* (Wall.) Momiy (wn.be).

- *Vitis vinifera* L. subsp. *sylvestris* (Willd.) Hegi: the name *V. sylvestris* C.C. Gmel., applicable for the Asian-European wild grape, is a younger homonym of *V. sylvestris* Bartram and therefore illegitimate. A substitute name, *V. gmelinii* Buttler, was therefore needed (Buttler 2017). At the subspecies rank, as applied in NF, the name remains unchanged but the author citation needs to be corrected to '(Willd.) Hegi' (Ferrer-Gallego *et al.* 2019).

- *Parthenocissus quinquefolia* (L.) Planch.: this species is not only grown as an ornamental but has also been recorded as an escape (wn.be). A character useful for its separation from *P. inserta* (A. Kerner) Fritsch (the dull upper leaf surface) was added.

78. Fabaceae

- Two additional, casual alien taxa have been observed: *Arachis hypogaea* L. (scattered records since 1950) and *Scorpiurus vermiculatus* L. (recorded once, in 1957 in Brussels; herb. L. Delvosalle). Two ornamentals, *Styphnolobium japonicum* (L.) Schott and *Wisteria sinensis* (Sims) Sweet, have occasionally been recorded as escapes from or relics of cultivation (wn.be).

- Nomenclatural and taxonomic notes regarding casual alien taxa: the oldest valid name for the species named *Sesbania exaltata* (Rafin.) Rydberg ex A.W. Hill in NF6 is *S. herbacea* (Mill.) McVaugh. Three subspecies of *Scorpiurus muricatus* L. are now treated as distinct species, *S. muricatus* s.str., *S. subvillosus* L. and *S. sulcatus* L.

- The species named *Chamaecytisus hirsutus* (L.) Link in NF6 is now transferred again to *Cytisus* Desf., as *C.*

hirsutus L., the genus in which it was originally described (Cristofolini & Troia 2006). This species in fact encompasses two distinct but poorly known species in the Flora area, *C. hirsutus* s.str. and *C. lotoides* Pourr. (Coulot & Rabaute 2016, FG). Both are now included in the key and full accounts are presented. *C. hirsutus* has erect or ascending stems (at least the older ones, those of the current year are generally radiant), while in *C. lotoides* the older stems are lying down and those of the current year are generally ascending or even erect. The corollas of *C. hirsutus* are a pale sulfur yellow, turning rather late to dirty pink, while *C. lotoides* has bright yellow corollas that turn very quickly to dirty pink. Finally, leaflets of *C. hirsutus* are regularly over 15 mm long and larger and less densely hairy on the upper surface than those of *C. lotoides*, which are rarely 15 mm in length and are usually very hairy on the upper face (Coulot & Rabaute l.c.). The distinction between these two species, however, remains critical and some populations are difficult to assign unambiguously. A well-known historical population of *C. hirsutus* from Séchault (Ardennes department) was recently re-identified as *C. lotoides* (Bizot & Averlant 2013). Its habit indeed seems to suggest the latter species although corollas are not as bright as they should be. This species complex obviously requires further study.

- The parental species of the widely grown ornamental shrub *Cytisus* ×*praecox* Wheeler ex Bean are *C. multiflorus* (L'Hérit.) Sweet and *C. oromediterraneus* Rivas Mart. *et al.* The latter was referred to as *C. balansae* (Boiss.) Ball subsp. *europaeus* (G. López et Jarvis) Muñoz Garmendia in NF6 but the inclusion of this subspecies in *C. balansae* is incorrect (Cubas *et al.* 2006).
- The species named *Genistella sagittalis* (L.) Gams in NF6 is now transferred again to *Genista* L., as *G. sagittalis* L., the genus in which it was originally described (Pardo *et al.* 2004).
- *G. tinctoria* L.: the taxonomic value of the infraspecific taxa mentioned in NF6 is probably weak (FG).
- *Ulex minor* Roth: this species is naturalized in at least two localities in the Flora area. It is now included in the key and a full account was added.
- *Lupinus polyphyllus* Lindl.: this name undoubtedly covers several species, hybrids or cultivars. At least some (or most?) plants named as such actually belong to *L. ×regalis* Bergm. (*L. arboreus* Sims × *polyphyllus*), recognizable by its usually branched stem with several inflorescences and the upper calyx lip notched (*L. polyphyllus* s.str. is characterized by a single stem with one inflorescence and an entire upper lip of the calyx).
- From the genus *Robinia* L., an additional taxon is currently increasingly planted and sometimes escapes, *R. ×margaretta* Ashe (*R. pseudoacacia* L. × *hispida* L.) (FG, wn.be).
- The generic limits of *Vicia* L. have changed since NF6, as a result of recent molecular studies (Schäfer *et al.* 2012). *V. tetrasperma* (L.) Schreb. is transferred again to

Ervum L., the genus in which it was originally described (as *E. tetraspermum* L.). Similarly, three further species, the native *V. hirsuta* (L.) S.F. Gray and the introduced *V. ervilia* (L.) Willd. and *V. sylvatica* L., are now accommodated in the genus *Ervilia* Link, as *E. hirsuta* (L.) Opiz, *E. sativa* Link and *E. sylvatica* (L.) Schur, respectively.

- The casual alien *Vicia narbonensis* L. comprised two subspecies in NF6, subsp. *narbonensis* and subsp. *serratifolia* (Jacq.) Cesati. These are now treated as two distinct species, *V. narbonensis* s.str. and *V. serratifolia* Jacq., respectively.
- Similarly, the subspecies of *V. villosa* Roth, as recognized in NF6, are now treated as distinct species, *V. villosa* s.str. and *V. dasycarpa* Ten. [syn.: *V. villosa* subsp. *varia* (Host) Corb.], and the same applies to *V. sativa* L. that now comprises three separate species, *V. angustifolia* L. [syn.: *V. sativa* subsp. *nigra* (L.) Ehrh.], *V. segetalis* Thuill. [syn.: *V. sativa* subsp. *segetalis* (Thuill.) Čelak.] and *V. sativa* s.str. Still others have been reported or even newly described within the Flora area lately (i.e., *V. austroccidentalis* Bomble et Loos and *V. multicolorans* Bomble et Loos) (Bomble & Loos 2004) but they are probably of (very) limited taxonomic value (they are not referred to in other contemporary Floras where these species likely occur, e.g. in FG; see also Buttler 2009).
- Two subspecies of *Ervum tetraspermum* L. are now treated as two distinct species, *E. tetraspermum* s.str. and *E. gracile* DC. [previously *V. tetrasperma* (L.) Schreb. subsp. *gracilis* (DC.) Hook. f.].
- *Lathyrus linifolius* (Reichard) Bässler: the two varieties distinguished in NF6 are probably of limited taxonomic value and merely refer to individual variations (FG).
- Morphologically intermediate plants between *L. sylvestris* L. and *L. latifolius* L. exist here and there in the Flora area, sometimes in large populations and known for several decades. These plants could refer to *L. heterophyllus* L. Corollas of these plants have the size and color of that of *L. sylvestris* (fleshy pink, often washed with green at the base) but the wings of the petiole as well as the size of the leaves correspond rather to *L. latifolius* L. However, a broadleaved form of *L. sylvestris* [subsp. *platyphyllos* (Retz.) Hartm.] is hardly distinguishable from these plants. Genetic studies could eventually resolve the complex taxonomy of this group. In addition, *L. heterophyllus* itself is also variable. In its typical form (var. *heterophyllus*), the upper leaves have two or three pairs of leaflets while in western and northern Europe (including in the Flora area), all plants have only one pair of leaflets and belong to var. *unijugus* Koch. Additional studies are required to solve this problem (<http://alien-plantsbelgium.be/content/lathyrus-heterophyllus-potentially-overlooked-alien-belgium>).
- According to some recent studies *Pisum* L. belongs in *Lathyrus* L. (Schäfer *et al.* 2012). The corresponding name for *P. sativum* L. in the latter genus was added, *L. oleraceus* Lam.

- Two species of *Ononis* L., often hardly distinguishable, *O. repens* L. and *O. spinosa* L., are now treated as a single variable species (*O. spinosa*) with two subspecies, respectively subsp. *procurrens* (Wallr.) Bonnier et Layens and subsp. *spinosa*, following other recent Floras (FG, H24).
- The generic boundaries of *Trigonella* L. underwent dramatic changes in the past decades. Based on flower tripping mechanism numerous ‘medicagoid’ members were transferred to the genus *Medicago* L. (Small 1987, Small *et al.* 1987, Small & Jomphe 1989) and molecular data approved this transfer (Bena 2001). The remainder of the genus *Trigonella*, however, still is a polyphyletic assemblage with about 55 species. The same molecular studies have shown that all species releasing coumarin (including fenugreek) are in fact nearer to *Melilotus* Mill. than to the other species of *Trigonella*. For reasons of priority all species traditionally accommodated in *Melilotus* were thus transferred to *Trigonella*. The non-coumarin species of *Trigonella* should be divided over several smaller genera, incl. *Medicago* for the ‘medicagoid’ taxa, some not yet described. The current names for the species of *Melilotus* already cited in NF6 are: *T. alba* (Med.) Coulot et Rabaute (syn.: *Melilotus albus* Med.), *T. altissima* (Thuill.) Coulot et Rabaute (syn.: *M. altissimus* Thuill.), *T. officinalis* (L.) Coulot et Rabaute [syn.: *M. officinalis* (L.) Lam.], *T. smallii* Coulot et Rabaute [syn.: *M. indicus* (L.) All.] and the casual aliens *T. sulcata* (Desf.) Coulot et Rabaute (syn.: *M. sulcatus* Desf.) and *T. wolgica* (Poir.) Coulot et Rabaute (syn.: *M. wolgicus* Poir.).
- Two additional casual alien species of *Trigonella* have been recorded lately: *T. procumbens* (Besser) Reichenb. and *T. infesta* (Guss.) Coulot et Rabaute (syn.: *Melilotus infestus* Guss.) (wn.be).
- The correct name for the species named *T. corniculata* (L.) L. in NF6 is *T. esculenta* Willd. (Hedge & Sales 2000).
- An additional casual alien species of *Medicago* L. has been recorded lately, *M. monspeliaca* (L.) Trautv. (syn.: *Trigonella monspeliaca* L.) (Ghent, 2015-2016).
- *M. sativa* L. and *M. falcata* L. are two interfertile tetraploids and thus better treated as a single variable species, *M. sativa*, with two subspecies, respectively subsp. *sativa* and subsp. *falcata* (L.) Arcang. Their hybrid is then called *M. sativa* nsubsp. *media* (Pers.) Schübl. et Martens.
- Two additional casual alien species of *Trifolium* L. have been recorded lately: *T. sylvaticum* Lois. (Ghent, 2016) and *T. vesiculosum* Savi (Antwerp, 2014-2016) (wn.be).
- *T. suffocatum* L., already briefly mentioned in NF6, based on a record from northwestern France, is completely naturalized now and thus included in the key and a full account is presented.
- A table of comparison between *T. repens* L. and *T. fragiferum* L. in NF6 is of no use, not a single feature is really convincing. Stipules (shape and degree to which the edges are serrated) are very variable and the drawings

might refer to one as well as to the other species (comm. P. Van Vooren). Analogously, petiole hairiness is variable. For instance, according to Poland & Clement (2009) *T. fragiferum* can either have glabrous or hairy petioles.

- The infraspecific taxa of *T. hybridum* L. are of limited taxonomic value and thus reduced from subspecies to variety rank, var. *hybridum* and var. *elegans* (Savi) Boiss., following other recent flora accounts (e.g. FG).
- *T. pratense* L. var. *maritima* Zabel is reported in FG from Pas-de-Calais, based on Coulot & Rabaute (2013). However, this is an error (comm. B. Toussaint, 12.2020; Coulot & Rabaute 2014), this variety only occurs south of the Flora area.
- The generic limits of *Lotus* L. have considerably changed, as a result of recent molecular phylogenetic studies. The genera *Dorycnium* Mill. and *Tetragonolobus* Scop. are now included in it (Degtjareva *et al.* 2006). As a consequence, three name changes were implemented: *Dorycnium hirsutum* (L.) Seringe became *Lotus hirsutus* L., *Tetragonolobus maritimus* (L.) Roth L. *maritimus* L. and *T. purpureus* Moench L. *tetragonolobus* L.
- The taxon called *L. corniculatus* L. subsp. *tenuis* (Waldst. et Kit. ex Willd.) Berher in NF6 is now treated as a distinct species, following other recent Flora accounts (FG, H24). At the species rank, the correct name is *L. tenuis* Waldst. et Kit. ex Willd., the binomial *L. glaber* Mill. having been rejected lately (Shenzhen Code Appendices).
- *L. maritimus* L.: the plants found in western Europe are usually ascribed to var. *hirsutus* (Willk.) Kerguelen. However, the distribution of the varieties is unclear. According to Valdés (2000) var. *maritimus* is the widespread taxon in the entire area of the species whereas according to FG, it is limited to the Midi in France.
- *Securigera* DC. was transferred again to *Coronilla* L., following FG, although molecular phylogenies apparently have not yet tested their boundaries. As a result, *Securigera varia* (L.) Lassen is now named *C. varia* L. again.

79. Polygalaceae

- *Polygala vulgaris* L.: three subspecies, recognized in NF6, are perhaps rather ecological variants and thus of low taxonomic value (FG).

80. Rosaceae

- Several additional species that are cultivated as ornamentals have been recorded as (usually ephemeral) escapes in the past years: *Neillia tanakae* Franch. et Sav. [syn.: *Stephanandra tanakae* (Franch. et Sav.) Franch. et Sav.], several species of the genus *Photinia* Lidl., especially *P. davidiana* (Decaisne) Cardot (syn.: *Stranvaesia davidiana* Decaisne) and *P. villosa* (Thunb.) DC., *Sibbaldiopsis tridentata* (Aiton) Rydb. and several species of the genus *Acaena* L., especially *A. caesiiglauca* (Bitter) Bergmans (wn.be).
- *Sorbaria* (Seringe ex DC.) A. Braun : yet other species than those treated in NF6, such as *S. kirilowii* (Regel)

Maxim. (syn.: *S. arborea* C.K. Schneider), have been observed spontaneously (wn.be) but their identity should be critically re-assessed.

- ***Spiraea*** L.: in addition to the taxa already mentioned in NF6, an additional taxon has occasionally been observed as an escape from cultivation, *S. ×macrothyrsa* (Zabel) Dippel (*S. douglasii* Hook. × *latifolia* Borkh.) (wn.be).

- *S. alba* Du Roi: in NF6 this species was said to have short stamens, i.e. as long as the petals (vs. clearly longer than the petals in *S. ×rosalba* Dippel). In fact, also in *S. alba* they are definitely longer than the petals, up to twice as long. In fact, American authors divide this species into two 'varieties': var. *alba* with short stamens and var. *latifolia* (Aiton) Dippel with long stamens. However, only the latter seems to be recorded in western Europe, at least in England (Silverside 1990) and probably elsewhere. Some plants are aberrant which further complicates this issue: leaves sometimes have a higher L/W ratio, irregular pollen and fruits are not produced, suggesting a hybrid, perhaps var. *alba* × var. *latifolia* (comm. J.-M. Tison 08.2016).

- ***Rubus*** L.: see Devriese & van de Beek (2023) for a detailed overview of taxonomic, nomenclatural and chorological adjustments. In addition, two alien species have recently been recorded as escapes from cultivation: *R. niveus* Thunb. (*R. cockburnianus* auct. non Hemsl.) (mostly Camp.) and *R. nutkanus* Moc. ex Ser. (syn.: *R. parviflorus* Nutt.) (Camp., Brab. or.) (wn.be). The latter is reminiscent of *R. odoratus* L. Its flowers are, however, white and the stalked glands of the pedicels yellow or red (not dark purple).

- ***Geum*** L.: the alien *G. macrophyllum* Willd. is now completely naturalized in the Flora area and expanding. It is included in the key and a full account is presented. A hybrid with native *G. urbanum* L., *G. ×convallis* M.P. Wilcox (Wilcox 2015b), was recently described from the British Isles and is expected to occur in areas in the Flora area where both species grow in close proximity.

- In NF6 (key to the species), *G. urbanum* L. was said to have ca. 70 achenes per head. This is incorrect, they are normally 120-140 in number (Wilcox 2015b; comm. P. Van Vooren 05.2017).

- The generic limits of ***Potentilla*** L. have considerably changed recently, as a result of molecular phylogenetic studies. The genus now includes *Duchesnea* Smith, whereas other species were transferred to segregate genera: *P. rupestris* L. to ***Drymocallis*** Fourr., *P. fruticosa* L. and related species to ***Dasiphora*** Raf. and *P. anserina* L. to ***Argentina*** Hill (Potter *et al.* 2007). These changes were also implemented in FG but only partly in Stace (2019) and H24. There is still a lot of controversy: Dobeš & Paule (2010) alternatively proposed to accept *Potentilla* in a very wide sense, as to include, among others, *Alchemilla* L., *Aphanes* L., *Comarum* L., *Dasiphora*, *Fragaria* L., etc. According to Töpel *et al.* (2011) many questions about the phylogenetic relationships in the genus have not yet been answered.

- An additional alien species with reddish petals has been observed as an escape of cultivation: *P. nepalensis* Hook. (Rillaar, 2010; wn.be). It differs from *P. atrosanguinea* Lodd. ex D. Don by its leaves with five leaflets (vs. ternate leaves).

- *P. supina* L.: this is a variable species with regard to form, size and sculpturing of the achenes (Soják 1987). The European plant belongs to subsp. *supina*, but several others have been introduced to Europe. The identity of these adventitious plants should therefore be studied, the other subspecies (of Asian and American origin) being distinguished mainly on the basis of the morphology of the achenes.

- *P. recta* L.: for several years now, a morph with bright yellow corollas has been observed in the Flora area (RR in Mar., Fl., Camp. and Brab., often on slag heaps, railway infrastructure, etc.). These plants probably belong to var. *obscura* (Willd.) W.D.J. Koch [syn.: subsp. *obscura* (Willd.) Arcang.], although the taxonomic value of this variation is uncertain.

- *P. verna* L. (nom. conserv.): this is the accepted name for the species that was called *P. tabernaemontani* Aschers. in NF6 (Brummitt 2011). See also FG, H24, etc.

- ***Argentina anserina*** (L.) Rydb.: the variation of this species, mentioned in NF6, is doubtlessly of no taxonomic value at all; the corresponding information was removed.

- The generic limits of *Sanguisorba* L. have changed as a result of molecular phylogenetic studies (Potter *et al.* 2007). *S. minor* Scop. was transferred again to the genus ***Poterium*** L. (as *P. sanguisorba* L.), the genus in which it was originally described.

- ***Alchemilla*** L.: the genus remains poorly known in the Flora area. In particular, the identification of taxa with a hairy upper leaf surface can be problematic. The shape of the sinus at the base of the leaf blade appears to be variable, even in a single individual, and should be evaluated in the field. This is probably a weak feature in distinguishing certain species. The problem should be reconsidered.

- *A. micans* Buser: this species was reduced to varietal rank under *A. acutiloba* Opiz. Other contemporary Floras, e.g. FG, even consider both to be conspecific.

- *A. mollis* (Buser) Rothm.: this cultivated ornamental is now widely naturalized in the Flora area. It is included in the key and a full account is presented.

- The genus ***Rosa*** L. was thoroughly revised by A. Zwaenepoel. The new account and key greatly differ from that in previous editions of NF. For the dogroses (sect. Caninae DC.), the most speciose group in the Flora area, the account is now in line with the views developed and published by Bakker *et al.* (2019), based on a consensus among British and Dutch rhodologists. This means that the account is roughly in agreement with other recent West European flora accounts such as H24 and Stace (2019) but considerably deviates from that of e.g. FG. The identification key of Zwaenepoel (2019a) was used

as a basis and further expanded. Since hybrids are easily produced many of those known to occur in the Flora area were added to the key (in order of appearance): *R. ×inodora* Fr. (*R. agrestis* Savi × *elliptica* Tausch), *R. ×deseglisei* Boreau (*R. arvensis* Huds. × *corymbifera* Borkh.), *R. ×margerisonii* (Wolley-Dod) Wolley-Dod (*R. caesia* Sm. × *spinosissima* L.), *R. ×subcollina* (H. Christ) Vukot. (*R. caesia* × *corymbifera*), *R. ×dumetorum* Thuill. (*R. canina* L. × *tomentella* Léman), *R. ×grovesii* (Baker) Maskew (*R. canina* × *spinosissima*), *R. ×nitidula* Besser (*R. canina* × *rubiginosa* L.), *R. ×subcanina* (H. Christ) Vukot. (*R. canina* × *vosagiaca* N.H.F. Desp.), *R. ×insignis* Déségl. [*R. canina* × *squarrosa* (Rau) Boreau], *R. ×hibernica* Templeton (*R. corymbifera* × *spinosissima*), *R. corymbifera* × *tomentella*, *R. ×gremlii* (H. Christ) H. Christ (*R. micrantha* Borrer ex Smith × *rubiginosa*), *R. ×avrayensis* Rouy (*R. rubiginosa* × *tomentosa* Smith), *R. ×biturigensis* Boreau (*R. rubiginosa* × *spinosissima*), *R. ×timbalii* Crépin (*R. rubiginosa* × *tomentella*), *R. ×suberectiformis* Wolley-Dod (*R. sherardii* Davies × *tomentosa*), *R. ×andrzejowskii* Boreau (*R. spinosissima* × *tomentosa*), *R. spinosissima* × *vosagiaca*, *R. ×dumalis* Bechst. (*R. squarrosa* × *vosagiaca*), *R. squarrosa* × *stylosa* and *R. ×andegavensis* Bastard (*R. stylosa* Desv. × *canina*). Analogously, several additional species were added to the identification key: *R. sherardii*, *R. squarrosa* and *R. vosagiaca*, as well as the frequently cultivated and naturalizing *R. ferruginea* Vill.

- The application of the name *R. dumalis* Bechst. has long been controversial. This species is often considered to be a heterotypic younger synonym of *R. vosagiaca* or even as the correct name for the latter (Bakker *et al.* 2011). It is, however, a hybrid, of *R. squarrosa* × *vosagiaca* parentage, as demonstrated by Loos (1996) and Bakker *et al.* (2017). See also H24, Stace (2019).

- The correct name for *R. glauca* Pourr. (1788) is *R. ferruginea* Vill. (1779) (FG, Stace 2019).

- *R. ×dumetorum* Thuill.: this was long considered to be a synonym of *R. corymbifera* (e.g. Bakker *et al.* 2011, NF6). However, its type was examined in G by Graham & Primavesi (1990) and identified as *R. canina* × *tomentella* (Bakker *et al.* 2011). See also H24, Stace (2019).

- *R. spinosissima* L.: the Siberian var. *altaica* (Willd.) Rehd. (syn.: *R. altaica* Willd.), a slightly more upright growing plant, with glandular pedicels, is often planted as an ornamental and has been found as an escape here and there (for instance in the Antwerp port area). It should not be confused with the spontaneous cross between *R. spinosissima* and *R. rubiginosa*, which also has glandular pedicels.

- An additional ornamental species of *Rosa* L. has been recorded as an escape from cultivation, *R. nitida* Willd. (Oudenaarde, since 2015; wn.be).

- An additional ornamental species of *Prunus* L. has occasionally been recorded as an escape from cultivation, *P. tomentosa* Thunb. (Serskamp and Desselgem, since 2014; wn.be). It has leaves with a densely hairy lower surface.

- *P. ×fruticans* Weihe: the distinction of this hybrid from its parents, particularly *P. domestica* L. subsp. *insititia* (L.) Bonnier et Layens, is often delicate. In addition, genetic studies suggest that it is in fact a variety of *P. spinosa* L., rather than a hybrid (FG).

- *P. laurocerasus* L.: this ornamental shrub is no longer a casual escape from cultivation but is increasingly found in naturalizing populations in the Flora area, resulting from laurophyllisation processes (Walther 1999). It was added to the key and a full account was provided.

- The account for *Cotoneaster* Med. was updated, mostly based on Verloove (2013b). All more or less naturalized taxa were added to the key and full accounts were presented. This applies to the following taxa: *C. dammeri* C.K. Schneider, *C. dielsianus* Pritzl, *C. divaricatus* Rehd. et E. Wilson, *C. fangianus* T.T. Yu, *C. franchetii* Bois, *C. hjelmqvistii* Flinck et B. Hylmö, *C. rehderi* Pojark., *C. salicifolius* Franch., *C. simonsii* Baker, *C. sternianus* (Turriell) Boom, *C. villosulus* (Rehd. et E. Wilson) Flinck et B. Hylmö, *C. ×suecicus* G. Klotz and *C. ×watereri* Exell.

- In addition, several other taxa have been recorded in the wild in the past years, usually as ephemeral escapes from cultivation. Taxa with erect or sub-erect, pinkish tepals: *C. ambiguus* Rehd. et E. Wilson, *C. ascendens* Flinck et B. Hylmö, *C. boisianus* G. Klotz, *C. ganghobaensis* Fryer et B. Hylmö, *C. laetevirens* (Rehd. et E. Wilson) G. Klotz, *C. lucidus* Schltld., *C. mairei* H. Léveillé, *C. moupinensis* Franch., *C. nanshan* M. Vilm. ex Mottet and *C. qunghbixiensis* Fryer et B. Hylmö. Taxa with patent, usually white tepals: *C. conspicuus* Marquand and *C. hylmoei* Flinck et B. Hylmö (Verloove 2013b). The identification of *Cotoneaster* is not easy, in part because cultivated (and escaped) plants are often horticultural lines which no longer have much to do with their wild Chinese ancestors (as a result of cloning, multiple hybridizations, etc.). For an accurate identification, the availability of complete material (flowers, fruits and leaves) and observed at several stages of development are required.

- *Malus sylvestris* (L.) Mill. subsp. *mitis* (Wallr.) Mansf.: when accepted as a distinct species, the cultivated apple is called *M. pumila* L. in some contemporary Floras, e.g. in FG. It is an older but lesser known synonym of *M. domestica* Borkh. and thus has priority. However, the latter binomial was recently conserved (Applequist 2017) and thus should be applied. *M. pumila* was added as a synonym.

- *Pyrus communis* L.: the taxonomy of this complex group is very controversial. The two taxa distinguished in NF6 as subspecies [subsp. *communis* and subsp. *pyraster* (L.) Ehrh.] are considered to be good species by some authors, *P. communis* being genetically closer to *P. caucasica* Fedorov and *P. nivalis* Jacq. than to *P. pyraster* (L.) Du Roi (Zheng *et al.* 2014), or considered to be of little taxonomic value by others.

- A further species of *Pyrus* L. should be looked for in the extreme southern part of the Flora area, especially in Champ. mér., *P. cordata* Desv. It has smaller petals (usu-

ally less than 8 mm wide), small fruits (8-20 mm) with an early deciduous calyx and slender fruit stalks less than 1,5 mm across (FG, Stace 2019). It has recently been recorded near Reims (Montagne de Reims: Tert. par.; database CBN Paris) and may have been overlooked. See also Rameau *et al.* (1989).

- *Amelanchier ovalis* Med.: in the Flora area, all populations reportedly belong to subsp. *embergeri* Favarger et Stearn. However, the taxonomic importance of this taxon is appreciated very differently by various authors. FG does not list infraspecific taxa while FT accepts the taxon as a separate species, *A. embergeri* (Favarger et Stearn) Landolt (tetraploids vs. diploids). According to *Atlas Flora Europaeae* (Kurtto *et al.* 2013), there is little support for recognizing (cyto-) taxa.

- Molecular phylogenetic studies have shown *Mespilus* L. to be embedded in *Crataegus* L. (Lo *et al.* 2007). *M. germanica* L. was thus transferred to *Crataegus*, as *C. germanicus* (L.) Kuntze. It should be noted that this transfer is not uncontested and not followed by all recent workers, e.g. H24, Phipps (2016).

- *C. rhipidophylla* Gandoger: the application of this binomial is not uncontested. Some contemporary Floras, e.g. FG, use *C. rosiformis* Janka instead. This is a nom. inval. (1870) according to Buttler (<https://www.kp-buttler.de/florenliste/>) but that is not correct since the name was later validly published by Janka, in 1874. Moreover, the name *C. rhipidophylla* can no longer be used for our plant, since its type belongs to *C. ×subsphaerica* Gandoger (FG). Therefore, unless this name would be conserved with a new type, it is better to use *C. rosiformis*, although this name is not without controversy either because Janka's type specimen is not complete and its identity also uncertain. In the absence of agreement among authors, the oldest unequivocal name appears to be *C. praemonticola* Holub (Schmidt 2015).

- *C. rosiformis* Janka: in NF6, a variety with usually ellipsoidal-subcylindrical fruits that are crowned with erect or suberect sepals that are 1.5-3.1 times as long as wide and with lower leaf segments with (7-)12-18 teeth on either side is referred to *C. rhipidophylla* var. *lindmanii* (Hrabětová-Uhrová) K.I. Christens. The taxonomic value of this variety probably requires confirmation but a combination under *C. rosiformis* was apparently lacking and was validated: *C. rosiformis* var. *lindmanii* (Hrabětová-Uhrová) Verloove & Galasso (Verloove & Galasso 2023).

- *Sorbus* L.: according to recent molecular studies the genus *Sorbus* is not monophyletic and could be divided into several micro-genera. A novel taxonomic framework was developed by Sennikov & Kurtto (2017) and Kurtto *et al.* (2018) for *Atlas Flora Europaeae*. Pending further research, only names in new genera were listed, as synonyms (see also FG, Stace 2019, H24). Only *S. aucuparia* L. belongs in *Sorbus* s.str. The other taxa are transferred as follows: *S. ×thuringiaca* (Nyman) Fritsch is now *Hedlundia ×thuringiaca* (Nyman) Sennikov et Kurtto, *S. domes-*

tica L. is *Cormus domestica* (L.) Spach, *S. torminalis* (L.) Crantz is *Torminalis glaberrima* (Gandoger) Sennikov et Kurtto, *S. aria* (L.) Crantz is *Aria edulis* (Willd.) M.J. Roem.), *S. ×tomentella* Gandoger is *Karpatisorbus hybrida* (Borkh.) Sennikov et Kurtto, *S. latifolia* (Lam.) Pers. is *Karpatisorbus latifolia* (Lam.) Sennikov et Kurtto, *S. remensis* Cornier is *Karpatisorbus remensis* (Cornier) Sennikov et Kurtto and *S. intermedia* (Ehrh.) Pers. is *Borkhausenia intermedia* (Ehrh.) Sennikov et Kurtto.

- *S. graeca* (Lodd. ex Spach) S. Schauer [syn.: *Aria graeca* (Lodd. ex Spach) M.J. Roem.] has recently been reported from Lorr. nord-or. (Gutland, in Germany), at the limit of the territory of the Flora (FT). Considering the distribution of this species, in southeastern Europe, it is probably rather a micro-endemic, not yet described species, resembling *S. graeca* (comm. R. Hand, 03.2021).

81. Elaeagnaceae

- *Hippophae rhamnoides* L.: native populations of this species belong to subsp. *rhamnoides*, while shrubs that are cultivated as ornamentals (occasionally observed as escapes as well), with narrower leaves and with much more elongated and straight branches, usually belong to subsp. *fluviatilis* v. Soest. Still others, also cultivated and escaping, are often taller shrubs or small trees with yellowish fruits and winter buds with at least 6 scales (female flower) or 15-35 (male flower) (resp. 2-3 or less than 10 in subsp. *rhamnoides*). Sequencing analyses (two cpDNA loci and one nuclear gene) identified plants escaped in coastal dunes in Koksijde as a common haplotype of *H. rhamnoides* from the Caucasus, subsp. *caucasica* Rousi (comm. I. Bartish, 07.2016).

- Two ornamental species of *Elaeagnus* L. are now completely naturalized in the Flora area, *E. umbellata* Thunb. and *E. angustifolia* L. A key for their identification and full accounts are presented.

- Several additional species (incl. hybrids) of *Elaeagnus* are cultivated as ornamentals and increasingly observed as escapes. In addition to those already mentioned in NF6, *E. macrophylla* Thunb. has also been recorded (wn.be). *E. multiflora* Thunb., a native of East Asia, is very rarely found spontaneously. It is similar to *E. umbellata* but is distinguished by its pauciflorous inflorescence (1-2 flowers, despite its name) and its larger fruits (more than 10 mm) that are long-pedicellate and pendulous (pedicel up to 50 mm long).

82. Rhamnaceae

- An alien species of Rhamnaceae was observed in the Flora area: *Ziziphus lotus* (L.) Lam. A single young shrub was detected at the foot of a wall in the city of Ghent in 2006 and persisted for some years there (wn.be).

- *Rhamnus alaternus* L. is very rarely grown as an ornamental shrub. In a transport zone in Rekkem (Brab. occ.), a self-sown individual persists since 2014 at the foot of an unloading quay for containers.

83. Ulmaceae

- *Ulmus campestris* L.: a proposal for the rejection of this binomial was accepted by the Shenzhen Code (Appendix Code Botanical Nomenclature).
- *U. minor* Mill.: within this very variable species, the English botanist Melville formerly distinguished several ‘microspecies’ which hybridized easily with each other, so that, according to this author, *U. minor* in fact can be considered to represent binary or ternary hybrids. In NF6, it was said that this taxonomic system is hardly accepted today. However, it should be noted that recent British Floras (e.g. Sell & Murrell 2018, Stace 2019) still adopt this classification.

84. Cannabaceae

- *Humulus scandens* (Lour.) Merrill: there has been a lot of controversy about the application of this binomial and some contemporary Floras, e.g. FG, use the (younger) name *H. japonicus* Siebold et Zucc. instead. However, a proposal for the rejection of *Antidesma scandens* Lour. (Zeng & Ma 2009), its basionym, was rejected (Barrie 2011).

85. Moraceae

- *Broussonetia papyrifera* (L.) Vent.: this shrub, native to East Asia, is cultivated for ornament and is sometimes observed as an escape, at least since 2005 (old walls, etc.; wn.be). Its branches and leaves are bristly hairy and its false fruits globular and orange when ripe.
- *Morus alba* L.: the exact identity of mulberry plants with leaves with hairless upper sides is uncertain. Plants, also found as escapes, with large (more than 10 cm long), deeply palmatipartite leaves, may belong to another species, *M. kagayamae* Koidzumi.

86. Urticaceae

- *Urtica membranacea* Poir. ex Savigny: this alien species was already mentioned in NF6. It could naturalize in urban habitats in the near future, as it has done recently in the Netherlands (H24, Denters 2020). It differs from *U. urens* L. by its unisexual flower clusters that are at least 2 cm long, the male ones with a broadly winged axis.

90. Juglandaceae

- *Juglans* L.: in addition to *J. regia* L. and *J. nigra* L., other species have recently been recorded as escapes, but their identification requires further study. *J. cf. mandshurica* Maxim. was observed along river Rupel (2020) and plants similar to *J. cinerea* L. are rather regularly seen (wn.be).
- In addition to the locally invasive *Pterocarya fraxinifolia* (Poir.) Spach, its hybrid with *P. stenoptera* DC., *P. ×rhederiana* C.K. Schneider, is also cultivated. It is recognizable by its winged leaf. This hybrid has been observed very rarely as an escape from cultivation, e.g. along river Maas in Neerharen in 2011 (wn.be).

91. Betulaceae

- *Alnus* L.: several species and hybrids of this genus are cultivated for ornament in parks and along avenues. The hybrid *A. ×spaethii* Callier [*A. japonica* (Thunb.) Steud. × *subcordata* C.A. Mey.], with large elliptical leaves, has rarely been observed as an escape (wn.be).
In Lorr., west of Metz, *A. alnobetula* (Ehrh.) K.Koch subsp. *suaveolens* (Req.) Lambinon & Kerguelen has been reported from several localities (FLORAINE 2013; also Vernier 2020 mentions this taxon). It is a Corsican endemic that was planted by the Office national des forêts in e.g. Rudemont (Arnaville (57) and in Rupt-de-Mad (comm. S. Antoine, 05.2021).

92. Cucurbitaceae

- Two additional alien species have recently been observed in the Flora area. *Ecballium elaterium* (L.) A. Rich. has been known as a weed in gardens in Rethel (Champ.) for a number of years (Bertaux 2011) and *Thladiantha dubia* Bunge was observed in Tienen in 2010 (wn.be).
- An additional alien *Cucurbita* L. has been observed as an ephemeral alien: *C. moschata* Duchesne (e.g. Roese-lare, 2014; wn.be).
- An additional alien *Cucumis* L. has been observed as an ephemeral alien: *C. dipsaceus* Ehrenb. ex Spach (Bossuit, 2018; wn.be).

94. Celastraceae

- An additional species of *Euonymus* L. has occasionally been recorded as an escape from cultivation, *E. alatus* (Thunb.) Siebold (wn.be, since 2011). It resembles *E. europaeus* L. but differs from it by its almost sessile leaves and its usually winged stems.
- In NF6, coastal populations of *Parnassia palustris* L. were ascribed to var. *condensata* Travis et Wheldon but this taxon is probably of limited taxonomic value (a mere ecotype). Although plants seem to differ in chromosome number (diploids vs. tetraploids) (Gornall & Wentworth 1993), there is no differentiation in allozymes, cpDNA and phenotype (Bonnin *et al.* 2002). It is ignored by most temporary Floras (FG, H24, etc.).

95. Oxalidaceae

- The account for *Oxalis* L. was improved based on Hoste (2012). Two increasingly naturalized species, *O. debilis* Kunth and *O. dillenii* Jacq., were added to the key and full accounts are now presented. Several additional species have been recorded lately, usually as casual escapes from cultivation (*O. articulata* Savigny, *O. triangularis* A. St.-Hil.) or as contaminants in plant containers (*O. conorrhiza* Jacq., *O. exilis* A. Cunn. and *O. pes-caprae* L.) (Hoste 2012, 2014).
- The name *O. stricta* L., not *O. fontana* Bunge, is upheld for the North American species that is long-naturalized and weedy in Europe, for the reasons explained by Ward (2004) and Nesom (2016), contrary to e.g. FG.

96. Hypericaceae

- An additional species of *Hypericum* L. is occasionally recorded as a casual escape from cultivation, *H. olympicum* L. (scattered records since 2014; wn.be).
- *H. majus* (A. Gray) Britton: this North American weedy species was discovered on the exposed banks of dried out fens in the northeastern part of Camp. in the Netherlands, for the first time in 2014. It seems to have established itself there in a short period of time and at present occurs with thousands of individuals in several localities near Nieuw-Bergen (wn.nl, H24).
- *H. perforatum* L. subsp. *veronense* (Schrank) Cesati: in NF6, narrow-leaved forms of *H. perforatum* were mentioned but these were considered to be a mere ecotype from arid substrates. However, the presence of genuine subsp. *veronense* was recently confirmed in the Flora area (France). It is in fact mostly characterized by capsule characters: capsule valves have large swollen (vesicular) vittae; in addition, leaves are all sessile and usually much narrower and with often inrolled margins. In subsp. *perforatum* capsules valves have narrow linear or punctiform vittae, leaves are (at least in part) petiolate and flat and wide (Robson 2002, Ciccarella & Garbari 2005, Ciccarella *et al.* 2003, FG).
- *H. maculatum* Crantz and *H. dubium* Leers: the latter species is now considered as a subspecies of the former, subsp. *obtusiusculum* (Tourlet) Hayek, following other contemporary flora accounts (FG, Stace 2019, H24).

98. Violaceae

- An additional alien species of *Viola* L. is sometimes recorded as a casual escape from cultivation, *V. sororia* Willd. (scattered records, mostly in urban habitats, since 2018; wn.be).
- *V. collina* Besser: the potential presence of this species in the Flora area was suggested in NF6, based on historical claims from Virelles and Saint-Mihiel. According to all contemporary sources, this species does not occur north of the Doubs area in France [SI-Flore, FG; it was not mentioned by AFL nor by Vernier (2020)].
- *V. riviniana* Reichenb.: a form with very dark leaves is cultivated as an ornamental. The exact identity of these plants is uncertain. They probably belong to the cultivar 'Purpurea', although some of the material has been ascribed to the North American *V. labradorica* Schrank. Such plants are increasingly observed as escapes from cultivation.
- *V. persicifolia* Schreb.: this is a nomenclaturally ambiguous name that was recently suppressed by the Code (Appendix Code Botanical Nomenclature), the correct name being *V. stagnina* Kit. The plants found in the Flora area belong to *V. stagnina* var. *stagnina*. Just north of our area var. *lacteoides* (W. Becker & Kloos) Van den Hof is also found (Van den Hof *et al.* 2013).
- *V. calaminaria* (Gingins) Lej.: in accordance with other contemporary flora accounts (e.g. FG, H24), this species

is now reduced to subspecies rank, as *V. lutea* Huds. subsp. *calaminaria* (Gingins) Nauenburg.

- *V. tricolor* L.: the taxonomy of this group has changed, following other modern flora accounts (FG, Stace 2019, H24). In the Flora area, *V. tricolor* now includes three subspecies: subsp. *tricolor*, subsp. *curtisii* (E. Forster) Syme (known as *V. curtisii* E. Forster in NF6) and subsp. *saxatilis* (F.W. Schmidt) Arcang. The latter subspecies was (re-)discovered in 2012 on the Rocroi and Hauts-Buttés plateaus in the French part of the Ardennes district (Coppa & Thévenin 2012, Thévenin & Coppa 2013; comm. M. Espeut 04.2021). In fact, it was already known there in the 19th century (Callay 1900). Specimens collected in 1904 in Hauts-Buttés (Monthermé) were distributed by the Société pour l'étude de la Flore Franco-Helvétique (sub n°1480 *Viola lepida* Jord.: <http://www.botanicalcollections.be/specimen/BR0000013206802>). Apparently, this taxon fell into oblivion in the 20th century. It is an often unusually tall plant (up to 80 cm in height), normally perennial with sterile suckers and large flowers up to 3 cm tall. It grows in acidiphilic, unamended meadows and should be sought elsewhere in the Ardennes. Stace (2019) evokes similar (identical?) plants from hilly areas in the northern British Isles. These have been ascribed to subsp. *saxatilis* but might as well (or rather) represent variants or hybrids of *V. tricolor*.

In NF7, the aforementioned French literature references (incl. FG) were followed as far as nomenclature and taxonomy are concerned. However, the correct name for the taxon called *saxatilis* requires further study. German contemporary Floras (e.g. Hassler & Muer 2022) accept two distinct subspecies, subsp. *alpestris* (DC. ex Ging.) Ces. (syn.: subsp. *saxatilis*) (an Alpine annual with predominantly yellow corollas) and subsp. *polychroma* (A. Kern.) Nyman (a perennial of lower mountain ranges with predominantly violet corollas). If these are indeed distinct entities, then the plants from the Flora area evidently belong to the latter taxon.

100. Salicaceae

- The account for *Salix* L. was completely reworked by A. Zwaenepoel, but much additional research is needed to elucidate the problems within this genus. Numerous more or less regularly encountered and/or easily recognized hybrids were added to the key, as were several frequently grown ornamentals. Some additional nomenclatural and taxonomic remarks are presented hereunder.
- The name of some hybrids is uncertain and requires further study. In NF6, the name *S. ×alopecuroides* Tausch was applied to designate the hybrid of *S. fragilis* (now *euxina*) × *triandra*. However, *S. alopecuroides* Tausch (1833) is a younger synonym of *S. speciosa* Host (1828) and the latter binomial thus has priority. It should be noted, however, that Stace (2019) retained the name *S. ×alopecuroides* for a triple hybrid (*S. euxina* × *alba* × *triandra*).

The name of the hybrid *S. cinerea* × *purpurea* is also uncertain. In NF6, the binomial *S. ×sordida* A. Kerner

was applied for it but according to Stace (2019) its correct name is *S. ×pontederiana* Willd. However, POWO lists the latter as a synonym of *S. hastata* L. subsp. *hastata*.

In NF6, hybrids of *S. alba* × *triandra* were assigned to *S. ×erythroclados* Simonk. However, according to POWO its correct name is *S. ×eriocephala* Borbás (1880 vs. 1893). Other authors (e.g. Bartha 2021) consider the latter to be of *S. cinerea* × *triandra* parentage and thus *a priori* morphologically quite different.

- *S. fragilis* L., *S. euxina* I.V. Belyaeva, *S. ×fragilis* and *S. ×rubens* Schrank: the name *S. fragilis* has long been used for two different taxa, both for a West Asian species and for its hybrid with *S. alba*. Belyaeva (2009) proposed to reserve the name *S. ×fragilis* for the hybrid, while the previously unnamed parent species was newly described as *S. euxina*. This point of view was followed by most subsequent flora accounts in western Europe (e.g. H24, Stace 2019, Zwaenepoel 2019b, this account), but not by everyone (e.g. Hassler & Muer 2022). Indeed, some recent authors dispute this opinion (Marchenko & Kuzovkina 2022) and strongly recommend to continue using *S. fragilis* as the name for a glabrous crack willow and *S. ×rubens* for its hybrid with *S. alba* (as per NF6). The issue requires further study.

- Zwaenepoel (2019b) presented a key for the identification of infraspecific taxa and cultivars of *S. alba* and related taxa (these were not included in NF7). See also Belyaeva *et al.* (2018).

- The taxonomy and nomenclature of the weeping willows is complex. Two hybrids were accepted, *S. ×pendulina* Wender (*S. babylonica* × *euxina*) and *S. ×sepulcralis* Simonk. (*S. alba* × *babylonica*). Other contemporary authors (e.g. Belyaeva *et al.* 2018, Belyaeva *et al.* 2021, H24) have merged these two taxa. Most plants in the Flora area belong to *S. ×pendulina* nothof. *tristis* (Gaudin) I.V. Belyaeva (syn.: *S. babylonica* × *×fragilis* f. *vitellina* I.V. Belyaeva).

- The correct name for *S. caprea* × *viminalis* probably is *S. ×smithiana* Willd. (syn.: *S. ×sericans* Tausch ex A. Kerner) (Stace 2019, H24). According to some authors, however, *S. ×smithiana* is a synonym of *S. gmelinii* Pall. (POWO). Both are indeed similar and often confused. However, the leaves of *S. ×smithiana* are considerably shorter and wider and the veins are deeply impressed. Lenticels on branches and trunks are remarkably diamond-shaped (as in *S. caprea*) and the buds of the male plants are large and have a yellow-green top (as in *S. caprea*).

- A first step toward recognizing several hybrids of *S. udensis* Trautv. et C.A. Mey. in Belgium was recently published by Zwaenepoel *et al.* (2021), although this issue certainly requires further study.

- *S. atrocinerea* Brot. was considered to be a separate species in NF6. However, in the Flora area, transitional forms with *S. cinerea* are frequently observed. It is therefore better treated as a subspecies of the latter, subsp. *olei-*

folia Macreight. This point of view is followed by most contemporary authors in western Europe (e.g. Stace 2019, H24; see, however, FG).

- *S. eriocephala* Michaux: the application of this binomial in the Flora area remains uncertain and requires further investigation. According to some authors, these plants rather represent a hybrid of *S. eriocephala*, either with *S. purpurea* or with *S. petiolaris* Smith (Kuzovkina 2015).

- *S. gmelinii* Pall.: until recently, this species was called *S. ×dasyclados* Wimm., also in NF6, which is probably incorrect. The latter is probably of hybridogenous origin, probably derived from *S. viminalis* and an eastern European taxon (Belyaeva & Sennikov 2008).

- *S. purpurea* L.: the name var. *lambertiana* (Smith) Koch was upheld for the native taxon although this point of view is not uncontested. According to FG this only represents a juvenile phase of var. *purpurea* whereas POWO considers it to be a hybrid, *S. ×lambertiana* Smith, with hybrid formula *S. cinerea* subsp. *oleifolia* × *purpurea*. This issue requires further study.

- *S. repens* L.: the taxonomic framework of NF6 was kept for the time being, i.e. three subspecies are recognized, incl. subsp. *rosmarinifolia* (L.) Hartm., although claims of this latter subspecies require confirmation (all are probably erroneous). Moreover, subsp. *dunensis* Rouy probably is a mere ecotype from coastal dunes of subsp. *repens* (after transplantation, its characteristics hardly persist).

101. Euphorbiaceae

- An additional alien species of Euphorbiaceae has recently been recorded: *Manihot grahamii* Hook. (Leuven, 2017; wn.be).

- *Euphorbia lucida* Waldst. et Kit.: this adventive species was discovered on the banks of river Maas in Borgharen (Fluv., in the Netherlands) in 2012. It seems to have established itself there and at present occurs with several dozens of individuals (wn.nl). Although there initially was some doubt about this identity (H24), the species was positively identified recently (wn.nl).

- *E. characias* L.: in NF6, only subsp. *wulfenii* (Hoppe ex Koch) A.R. Smith was mentioned. By now subsp. *characias* has also been recorded but the separation of these two taxa is not always straightforward.

- *E. serpens* Kunth: in NF6, only subsp. *fissistipula* (Thell.) Verloove et Lambinon was mentioned. By now, subsp. *serpens* has also been recorded, for instance in a seemingly naturalized population in Ardoois in 2020 (wn.be).

- *E. esula* L. subsp. *tommasiniana* (Bertol.) Kuzmanov: according to Reichert *et al.* (2018) the correct name for this alien is subsp. *saratoi* (Ardoio) P. Fourn. A further synonym, frequently used by Russian authors for this taxon, was also added: *E. virgultosa* Klokov. The taxonomy of this group is very complicated and additional studies are needed. In the past, western European plants have been assigned – at least in part – to *E. ×pseudovirgata*

(Schur) Soó; this is a problematic name since its nomenclatural type in fact belongs to *E. virgata* Waldst. et Kit. (Reichert *et al.* l.c.).

Duluc (2019) demonstrated that the presence (subsp. *saratoi*) or absence (subsp. *esula*) of stomata on the upper leaf surface is the only reliable character to separate these two subspecies.

• In Champ. mér., a species very similar to *E. esula* has been recorded in basiphilous xerothermophilous wood margins and grasslands, *E. loreyi* Jord. It is a more slender plant, with sterile stems with shorter cauline leaves (usually not exceeding 30 mm in length), terminal umbels with often less than ten rays and with stomata located on the upper surface near the midrib and towards the apex. In the Flora area, this species has been recorded in Champfleury and Mailly-le-Camp, south of Épernay (database CBN Paris, FG).

• *E. dulcis* L. subsp. *purpurata* (Thuill.) Rothm.: the correct name at subspecies level for this taxon is subsp. *incompta* (Cesati) Nyman (Digitale2, FG).

• *E. brittingeri* Opiz ex Samp.: this species is best considered as a subspecies of *E. flavicoma* DC., subsp. *verrucosa* (Fiori) Pignatti (Digitale2, FG).

104. Geraniaceae

• An additional alien species of *Pelargonium* L'Hérit. was recorded as an ephemeral alien, *P. candicans* Spreng. (Bilzen, 2017).

• Two additional ornamental species of *Geranium* L., *G. psilostemon* Ledeb. and *G. wallichianum* D. Don ex Sweet, have been recorded recently as ephemeral escapes from cultivation (wn.be).

• *G. robertianum* L. subsp. *maritimum* (Bab.) H.G. Baker: this subspecies was reported from coastal cliffs in the extreme southern part of the Flora area (or just beyond it) in France. FG merely included this taxon, without further comment, in the variation of *G. robertianum* and neither is it mentioned in Digitale2. Stace (2019) also indicated that it is difficult to distinguish. The taxonomic value of this subspecies is probably weak.

• *G. purpureum* Vill.: this species and *G. robertianum* rarely hybridize, forming sterile triploid hybrids. From the Aachen area (Germany) two more or less intermediate fertile diploid (micro-) species have been described lately and these undoubtedly also occur elsewhere in the territory of the Flora: *G. urbanum* Bomble and *G. alboroseum* Bomble (Bomble 2016a). However, assessing the taxonomic value of these species requires further study. In fact, his hypothesis was not supported by chromosome counts and these two taxa could as well refer to local 'micro-species' derived from *G. robertianum* in connection with the autogamy and disomic inheritance of the latter (Van Rossum *et al.* 2021), combined with habitat selection (the mutation of a single gene is often enough to change e.g. the color of the flowers). Especially the latter species, with pale pink or whitish corollas, appears to be not rare at all.

• An additional alien species of *Erodium* L'Hérit. has been recorded as an escape, *E. trifolium* (Cav.) Cav. (Ghent, since 2017; wn.be).

• *Erodium cicutarium* (L.) L'Hérit.: two subspecies were recognized in NF6, subsp. *cutarium* and subsp. *dunense* Andreas. However, the latter probably merely represents part of the endless variation of *E. cicutarium*: flower color, presence or absence of spots on the petals, leaf shape and hairiness, etc. are variable characters in this species. Most contemporary Floras (e.g. Stace 2019, FG) no longer distinguish subsp. *dunense*. This issue is also recognized by H24 but apparently both taxa differ in genome size (Zonneveld 2019). Therefore, both taxa were upheld but it was added that their separation may be problematic.

105. Lythraceae

• An additional alien, ephemeral species was recorded: *Ammannia coccinea* Rottb. (Antwerp port area, 2016; introduced with rice, along with other rice weeds) (wn.be).

106. Onagraceae

• Some additional ornamental species have been recorded recently as casual escapes: *Clarkia amoena* (Lehm.) A. Nelson et Macbr., *C. elegans* Dougl. and *Gaura lindheimeri* Engelm. et A. Gray [syn.: *Oenothera lindheimeri* (Engelm. et A. Gray) W.L. Wagner et Hoch] (wn.be).

• Recent molecular studies suggest that the genera *Gaura* L. and *Oenothera* L. should perhaps better be combined (e.g. Wagner *et al.* 2007), a point of view not yet followed.

• *Ludwigia grandiflora* (Michaux) Greuter et Burdet: this species contains two subspecies, one decaploid [subsp. *hexapetala* (Hook. et Arnott) Nesom et Kartesz], the other hexaploid (subsp. *grandiflora*) (Zardini *et al.* 1991, Nesom & Kartesz 2000). The two are morphologically very similar. However, the former is more vigorous with larger flowers and leaves. The Belgian (and European) invasive populations belong to subsp. *hexapetala* (Armitage *et al.* 2013).

• *Oenothera* L.: the account for this genus was updated, based on new insights. However, only the more or less frequent and/or naturalized species have been included in the key and were given a full account. For a more detailed overview, including a determination key covering all taxa, see Rostański & Verloove (2015). The following species were added: *O. oehlkersii* Kappus ex Rostański and *O. rubricaulis* Kleb.

• Additional, casual or very local taxa were merely listed: *O. casimiri* Rostański, *O. drawertii* Renner ex Rostański, *O. ersteinensis* R. Linder et R. Jean (syn.: *O. perangusta* auct. eur. non R.R. Gates), *O. moravica* V. Jehlík et Rostański, *O. speciosa* Nutt., *O. suaveolens* Pers. (Rostański & Verloove 2015, with posterior records by the author) and *O. villosa* Thunb. (the latter with certainty only in Mont-sur-Meurthe in Lorr. mér.; Mahévas *et al.* 2015).

• *O. fallax* Renner: in the hybridogenic complex of *O. glazioviana* Micheli and *O. biennis* L. two more or less

distinct ‘morphotypes’ can be observed, one with a flower bud that is progressively narrowed towards the base and the apex and with long sepal tips that are usually at least 4 mm long, the other with a subcylindrical flower bud that is abruptly narrowed at the apex and with shorter sepal tips. Both types are present in the Flora area, the latter can be assigned to *O. velutina* Renner.

- Two species of *Epilobium* L. that are present in the Flora area, *E. angustifolium* L. and *E. dodonaei* Vill., are sometimes included in a separate genus, *Chamaenerion* Ség. (syn.: *Chamerion* Holub). However, the taxonomic relevance of this genus remains to be confirmed, as recent molecular studies are unconvincing (FG).
- The binomial for the hybrid *E. montanum* L. × *roseum* Schreb. was corrected. The nomenclatural type of *E. ×mutabile* Boiss. et Reut., the name applied in NF6, belongs to *E. parviflorum* Schreb. (annotation on the type specimen by G. Nieto Feliner, 1994). The correct name for this hybrid appears to be *E. ×heteroeruleum* Borbás (Stace 2019).
- *E. ciliatum* Rafin.: according to some authors (e.g. Jonsell & Karlsson 2010) this species in fact includes three species in Europe (*E. ciliatum* s.str., *E. adenocaulon* Hausskn. and *E. glandulosum* Lehm.) which can be distinguished on the basis of the size of the bracts, the length of the pedicels, the petal color, the presence or absence of winter rosettes and the branching pattern of the inflorescence. The plants found in the territory of the Flora are indeed very variable but difficult to attribute to the aforementioned species. At least for now, they are best considered as a single variable species unless molecular studies show that they indeed represent several distinct species.
- *E. brachycarpum* C. Presl: this North American species, a recent newcomer in the Flora area, is now naturalized and much expanding lately. It was added to the key and a full account is provided.

109. Sapindaceae

- *Cardiospermum grandiflorum* Swartz: this casual alien that was formerly said to have been collected as wool alien near Verviers, likely refers to an unreliable collection (Hoste & Verloove 2019). The name was removed from the list with casual aliens.
- Several additional species of *Acer* L. have been recorded recently as escapes from cultivation: *A. cissifolium* (Siebold et Zucc.) K. Koch (Lokeren, since 2014), *A. japonicum* Thunb. (scattered localities, since 2012) and *A. pensylvanicum* L. (very few localities, since 2010) (wn.be). Several others have also been recorded recently but their identity requires confirmation, e.g. *A. buergerianum* Miq., *A. davidii* Franch. and *A. macrophyllum* Pursh (wn.be).
- *A. campestre* L. var. *hebecarpum* DC.: the taxonomic value of this variety is probably limited (FG).
- *A. rufinerve* Siebold et Zucc.: this Japanese tree recently started to escape from cultivation locally, to such an ex-

tent that in some areas it is considered to be an invasive species (Rafalowicz *et al.* 2009). It was therefore added to the key and a full account was provided.

110. Rutaceae

- *Citrus* L. seedlings are rarely observed (e.g. on exposed river banks, landfills; wn.be). Such plants can be recognized by the winged petioles and the presence of an articulation at the junction with the leaf blade.

112. Malvaceae

- Two alien ephemeral species were recently newly recorded: *Modiola caroliniana* (L.) G. Don f. (Ghent, 2015-2016 and Bilzen, 2017; wn.be) and *Sphaeralcea bonariensis* (Cav.) Griseb. (Antwerp, 2016; wn.be).
- *Althaea* L. now includes only a single native species in the Flora area, *A. officinalis* L. *A. hirsuta* L. was transferred to *Malva* L., as *M. setigera* Spenn. *Althaea* was traditionally distinguished from *Malva* and related genera by six (or more) epicalyx segments. However, recent studies have shown that epicalyx characters are not informative at the generic level (Ray 1995, Davis 2010). Escobar García *et al.* (2009) demonstrated that the annual species of *Althaea* doubtlessly belong in the *Malva*-complex.
- An additional alien species of *Althaea* L. has been recorded in two localities in Lorr., *A. cannabina* L. (FLO-RAINE 2013).
- The generic limits of *Malva* L. have considerably changed, as a result of molecular phylogenetic studies. The traditional generic distinction between *Lavatera* L. and *Malva* was based on fusion or non-fusion of the epicalyx but this character is very critical and turns out to be highly artificial and untenable (see for instance Ray 1995, Banfi *et al.* 2005). The relationships inferred from molecular data strongly contrast with this traditional classification (Escobar García *et al.* 2009). There are species in *Lavatera* (e.g. *L. mauritanica* Durieu and *L. triloba* L.) in which fusion of epicalyx segments differs between populations (Hinsley 2010). Some species traditionally included in *Lavatera* are more closely related to for instance *Malva sylvestris* L. than are some other species of *Malva*. Both genera are therefore better merged or *Lavatera* further divided into four or up to 12 independent genera (Banfi *et al.* 2005, Escobar García *et al.* 2009, Hinsley 2010). *Malva* having nomenclatural priority, all species formerly accommodated in *Lavatera* have been transferred to *Malva* (like was done in other contemporary regional Floras, e.g. FG, H24, Stace 2019).
- An additional ornamental species of *Malva* has recently been recorded as an escape of cultivation, *M. arborea* (L.) Webb et Berthel. (syn.: *Lavatera arborea* L.) (wn.be, Lemoine 2015b). In Mar., especially in Mar. mér., it could persist in coastal dunes near habitations. It is also known from coastal cliffs in Onival (Wattez 2018), south of the estuary of river Somme, i.e. beyond the Flora limits.

114. Cistaceae

- An alien, probably ephemeral species has recently been recorded: *Cistus alyssoides* Lam. [syn.: *Halimium alyssoides* (Lam.) K. Koch] (Destelbergen, 2012-2022; wn.be).
- *Helianthemum nummularium* (L.) Mill.: the two subspecies that were distinguished in NF6, subsp. *obscurum* (Čelak.) Holub and subsp. *nummularium* are probably of limited taxonomic value (FG). In Lorr., however, the former is accepted as a distinct species, *H. grandiflorum* (L.) Mill. (FLORAINE 2013), a synonym that was added.

119. Brassicaceae

- An additional casual alien species has been recorded recently, *Moricandia arvensis* (L.) DC. (Engis, 2017). A further alien species mentioned in NF6, *Malcolmia africana* (L.) R. Brown, is accommodated in a segregate genus by some authors (Al-Shehbaz *et al.* 2014). A synonym in that genus was added: *Strigosella africana* (L.) Botsch.
- *Malcolmia maritima* (L.) R. Brown: the exact identity of the plants found in the horticultural trade is uncertain. According to FG the widely cultivated species is *M. flexuosa* (Smith) Smith, or perhaps a hybrid of it. In the latter species fruiting pedicels are as thick as or broader than the fruit base, whereas in *M. maritima* fruiting pedicels are narrower than the fruit base. In plants that were recently observed in Belgium well-developed fruits are rather rarely seen, or not at all. In many cases, however, pedicels seem to be rather thick which indeed points at *M. flexuosa* – or even more likely (given poor fruit development) – hybrids of it with *M. maritima*.
- The generic limits of *Sisymbrium* L. have slightly changed. *S. supinum* L. was transferred to the genus *Erucastrum* C. Presl [now as *E. supinum* (L.) Al-Shehbaz et Warwick], following molecular phylogenetic studies and recent flora accounts (FG, H24).
- An additional alien species of *Sisymbrium* is now locally naturalized and increasingly observed, especially in urban habitats: *S. irio* L. It was added to the key and a full account is presented.
- An alien species of *Erysimum* L., *Erysimum crepidifolium* Reichenb., is known from Ralingen in the German Gutland (Lorr. nord-or.; FT). The species already appeared in the same region at the beginning of the 20th century, in the Sûre valley (Andres 1911).
- An additional casual alien species of *Conringia* Heist. ex Fabr. was recently recorded, *C. planisiliqua* Fisch. et C.A. Mey. (Antwerp port, 2013; wn.be).
- *Barbarea vulgaris* R. Brown: this species comprises three infraspecific taxa (either recognized as varieties or subspecies, depending on the authors) and all occur in the Flora area. According to recent molecular phylogenetic studies these may rather be three genetically distinct species (Toneatto *et al.* 2012): *B. vulgaris* s.str., *B. arcuata* Reichenb. and *B. rivularis* Martrin-Donos. Pending further studies, however, all three were maintained at subspecies rank.

- *Rorippa islandica* (Oeder) Borbás: this species was claimed from Lorr. by FLORAINE (2013), evidently in error for *R. palustris* (L.) Besser. In France, *R. islandica* only occurs in the Alps and Pyrenees and is lacking below 1600 m (FG).

- An additional alien species of *Cardamine* L. was recently observed, *C. graeca* L. (Verloove & Barendse 2020). Its persistence in a few localities has been confirmed subsequently (wn.be).

- The circumscription of *C. pratensis* L. has changed. The polyploid subspecies, subsp. *dentata* (Schult.) Čelak., is now accepted as a distinct species, *C. dentata* Schult. (see also FG and e.g. Melichárková *et al.* 2020, although this point of view was not followed in e.g. H24). These two taxa seem to represent, at least in parts of the Flora area and based on a limited sample, two clearly separated genotypes (with non-overlapping DNA contents) although their separation on morphological grounds is not always straightforward (preliminary results from a morpho-genetic study; comm. M. Leten, 07.2022): *C. dentata* has middle stem leaves with ovate to elliptic-elongated, clearly petiolate leaflets. The leaflets of the basal and lower cauline leaves have widely spaced, unequal teeth that are often separated by rather deep cuts; the terminal lobe is not significantly larger than the side lobes; the latter are numerous (10-24 in number). Petals are 9-16 mm long, often light pink or almost white. *C. pratensis*, in contrast, has middle stem leaves with narrow oblong-elliptic, sessile leaflets. The leaflets of the basal and lower cauline leaves usually have entire or weakly serrated leaflets; the terminal lobe is usually at least twice as large as the side lobes and the latter are less numerous (2-16 in number). Petals are 6-17 mm long, usually light to deep pink. *C. dentata* also tends to grow in wetter habitats.

- The East Asian weed *C. occulta* Hornem. (previously known as *C. hamiltonii* G. Don, *C. flexuosa* With. subsp. *debilis* O.E. Schulz or informally as ‘Asian Cardamine flexuosa’) is now widely naturalized in the Flora area. It was included in the key and a full account is presented. This octoploid species has long been confused with native *C. flexuosa* (tetraploid). It differs from it by the absence of a basal rosette, the leaves and stems that are (nearly) hairless and the usually lobed leaflets (Šlenker *et al.* 2018).

- *Cardaminopsis* (C.A. Mey.) Hayek was shown to be part of *Arabidopsis* Heynh. in recent molecular phylogenetic studies. As a consequence, both genera were merged, as was done before in other flora accounts (FG, Stace 2019, H24).

- The generic limits of *Arabis* L. have dramatically changed, as a result of molecular phylogenetic studies (e.g. Karl & Koch 2013). Three species included in this genus in NF6 have now been transferred to segregate genera: *Arabis glabra* (L.) Bernh. has become *Turritis glabra* L., *A. pauciflora* (Grimm) Garcke has become *Fourraea alpina* (L.) Greuter et Burdet and *A. turrata* L. has become *Pseudoturritis turrata* (L.) Al-Shehbaz.

- In NF6, *Arabis hirsuta* (L.) Scop. comprised three subspecies: subsp. *hirsuta*, subsp. *sagittata* (Bertol.) Nyman and subsp. *gerardii* (Besser) Hartm. f. These are now accepted as three distinct species, respectively *A. hirsuta* s.str., *A. sagittata* Bertol. and *A. planisiliqua* (Pers.) Reichenb., following FG. The latter is a critical species in the Flora area and its presence requires confirmation. Some populations from French Lorr. were formerly ascribed to *A. nemorensis* (Wolf ex Hoffman) Koch by G.H. Parment and this species was considered to be a synonym of *A. planisiliqua* in NF6. However, it is a quite different species, morphologically and ecologically, and with a different distribution as well. It was first incorrectly mentioned from France (FG) although recently it was found along the Doubs river near the Swiss border. The plants from French Lorr. possibly are just a form of *A. sagittata* (comm. J.-M. Tison, 10.2020). *A. planisiliqua* is distributed across southwestern Europe and reaches the valley of river Seine near Paris (SI-Flore), just beyond the boundaries of the Flora area.
- The naturalized ornamental *A. alpina* L. subsp. *caucasica* (Willd. ex Schlecht.) Briq. is now treated as a separate species, *A. caucasica* Willd. ex Schlecht., following e.g. FG and Stace (2019).
- *Alyssum saxatile* L. was transferred to the segregate genus *Aurinia* Desv., as *A. saxatilis* (L.) Desv., following other recent flora accounts (FG, H24, Stace 2019).
- *Draba* L. now also includes *Erophila* DC., following molecular phylogenetic studies (e.g. Jordon-Thaden *et al.* 2010).
- *D. verna* L.: this is a very variable species whose variation is poorly understood. As the species is autogamous, it shows locally discontinuous variations, sometimes interpreted as autonomous species. Three subspecies were recognized in the Flora area in NF6 but several additional taxa have been reported lately. Four species have recently been described from Mosan or. (Aachen; Germany): *D. acutidentata* Bomble, *D. aquisgranensis* Bomble, *D. kohlscheidensis* Bomble and *D. strigosula* Bomble (Bomble 2018). Two others, *D. glabrescens* Rouy et Foucaud (syn.: *Erophila glabrescens* Jord.) and *D. majuscula* Rouy et Foucaud (syn.: *Erophila majuscula* Jord.), sometimes mistakenly considered to be synonymous with *D. verna* subsp. *verna*, are known from the same region (Bomble 2011) and have been reported from the Netherlands as well (Mar., Camp. and Brab. or.; H24, wn.nl). DNA sequences and genome size measurements indeed seem to allow recognizing several species in western Europe (H24) but the identification of these species, based on morphological grounds, will require further study. Pending additional studies, the account was left unchanged (compare with FG).
- *Capsella rubella* Reut.: the taxonomic value of this species remains highly questionable, perhaps it is just a diploid line of *C. bursa-pastoris* (L.) Med. H24 therefore no longer recognized this species and provided a number of

good arguments for this. In NF7, both species were upheld, following FG and Stace (2019), but this issue probably needs to be reconsidered.

- An alien species of *Hornungia* Reichenb., *H. alpina* (L.) O. Appel, was observed as a casual escape from cultivation (Antwerp, 2013; wn.be).
- The generic limits of *Thlaspi* L. have considerably changed as a result of recent molecular phylogenetic studies (e.g. Koch & Al-Shehbaz 2004). Meyer (1973), in fact, already proposed an alternative generic circumscription and recognized twelve distinct genera, mainly based on seed-coat sculpture and other anatomical characters. In a strict sense, in the Flora area, *Thlaspi* only includes *T. arvense* L. and perhaps *T. alliaceum* L. [the latter probably also belongs in a segregate genus, as *Mummenhoffia alliacea* (L.) Esmailbegi et Al-Shehbaz; Esmailbegi *et al.* 2018]. *T. perfoliatum* L. now belongs in *Microthlaspi* F.K. Mey. [as *M. perfoliatum* (L.) F.K. Mey.] and *T. caerulescens* J. et C. Presl and *T. montanum* L. were transferred to *Noccaea* Moench, as *N. caerulescens* (J. et C. Presl) F.K. Mey. [with two subspecies, subsp. *caerulescens* and subsp. *calaminaris* (Lej.) Holub] and *N. montana* (L.) F.K. Mey. respectively.
- *Microthlaspi perfoliatum* (L.) F.K. Mey.: according to some authors (Ali *et al.* 2016), a second species exists in the Flora area, *M. erraticum* (Jord.) T. Ali et Thines (syn.: *Thlaspi erraticum* Jord.) but their separation on morphological grounds is not easy. Its silicles are elongated with an acuminate base and a sharp notch (angle < 45°) while *M. perfoliatum* has ± rounded silicles with a wedge-subrounded base and an obtuse notch (angle > 45°); the first is diploid, the other polyploid. Based on these characters, plants found in the Flora area are hardly distinguishable. The problem needs to be studied again.
- *Iberis intermedia* Guersent subsp. *violletii* (Soyer-Will. ex Godr.) Rouy et Fouc.: in NF6, there was some doubt about the application of this name for plants found in Pagny-1a-Blanche-Côte and Saint-Mihiel in French Lorr. The same views, however, were recently expressed in FG.
- The genus *Lepidium* L. is now more broadly circumscribed, as a result of molecular phylogenetic studies (e.g. Al-Shehbaz *et al.* 2002). It now also includes *Cardaria* Desv. and *Coronopus* Zinn. Three species from these genera are now called *Lepidium draba* L. [syn.: *Cardaria draba* (L.) Dev.], *L. coronopus* (L.) Al-Shehbaz [syn.: *Coronopus squamatus* (Forssk.) Aschers.] and *L. didymum* L. [syn.: *Coronopus didymus* (L.) Smith].
- *L. virginicum* L.: in the Flora area, this species normally has petals that are longer than the sepals. However, in North America the species is much more variable than here and also includes small-flowered plants. Such forms recently have also been observed with us, including in Ghent in 2020 (wn.be).
- *L. neglectum* Thell.: species rank for this taxon is certainly exaggerated. Some authors tend to accept it as *L. densiflorum* Schrad. subsp. *neglectum* (Thell.) P. Fourn.

(synonym added) but probably no taxonomic rank whatsoever should be assigned to it. It is completely ignored by contemporary North American authors (Al-Shehbaz & Gaskin 2010).

- Two additional casual alien species of *Brassica* L. were recorded: *B. barrelieri* (L.) Janka (Roeselare, 2013) and *B. carinata* A. Braun (wn.be). The latter is sometimes grown as an oilseed plant now and is a hybridogenic taxon derived from *B. oleracea* L. × *nigra* (L.) Koch. It resembles *B. juncea* (L.) Czern. a lot but its leaves have 0-1 lateral lobes, the beak of the fruit is shorter (2.5-6 mm long) and the sepals are longer (7-10 mm long). It has been recorded several times as an alien recently.

- *Rapistrum rugosum* (L.) All.: the subsp. *linnaeanum* (Coss.) Rouy et Fouc. and *orientale* (L.) Arcang. are probably the most widespread in our territory, and they are quite easily distinguished from subsp. *rugosum* but are themselves hardly distinguishable (compare with FG).

- *Raphanus raphanistrum* L. subsp. *landra* (Moretti ex DC.) Bonnier et Layens [incl. subsp. *maritimus* (Smith) Thell.]: this subspecies recently has established itself in the Flora area (or was overlooked for a long time?). It is keyed-out now and a full account is presented. The plant characteristic of nitrophilous communities from sands of the Mediterranean, Black Sea and southwestern Europe coasts belongs to subsp. *maritimus*. The latter is probably conspecific with subsp. *landra*, reputed to be essentially Mediterranean but extending as far north as the southern British Isles. The latter name has nomenclatural priority and is thus applied now. Morphologically intermediate plants between subsp. *landra* and subsp. *raphanistrum* are quite frequent (especially with pods sometimes narrower than usual in subsp. *landra*). Therefore, the coastal populations of *R. raphanistrum* in the Flora area must be carefully checked.

120. Santalaceae

- *Thesium divaricatum* Jan ex Mert. et Koch: species rank for this taxon is probably exaggerated, it was thus reduced to subspecies rank under *T. humifusum* DC., as subsp. *divaricatum* (Jan ex Mert. et Koch) Bonnier et Layens, following e.g. FG. (see also Pedrol & Laínz 2000 who even considered both to be conspecific).

123. Plumbaginaceae

- An additional alien species of *Limonium* L. has rarely been recorded as a casual escape from cultivation: *L. platyphyllum* Lincz. [syn.: *L. latifolium* (Sm.) Kuntze] (wn.be).

- *Armeria maritima* Willd. subsp. *elongata* (Hoffmann) Bonnier: at species rank, the correct name for this taxon is *A. vulgaris* Willd. (synonym added). Since the name *elongata* at subspecies rank is illegitimate, the name *A. vulgaris* for this taxon was applied by FG.

124. Polygonaceae

- Several taxa from other genera than those analysed in the key are cultivated for ornament. The following have

recently been observed as escapes from cultivation: *Acronogonon campanulatum* (Hook. F.) H. Hara (a small population persists in Oubraker since 2013; wn.be), *A. ×fennicum* Reiersen [*A. alpinum* (All.) Schur × *weyrichii* (F. Schmidt) H. Hara] (an occasional escape here and there since 2012; wn.be), *Muehlenbeckia complexa* (A. Cunn.) Meissn. (idem, since 2016; wn.be) and *Oxyria digyna* (L.) Hill. (an escape from the Ghent Botanic Garden, known since 2020 as a pavement weed; wn.be).

- Two additional *Rumex* L. hybrids have been recorded recently: *R. obtusifolius* × *longifolius* (*R. ×hybridus* Kindb.) (Lommel, 2013, with the parents; wn.be) and *R. obtusifolius* × *palustris* (*R. ×steinii* Becker) (occasionally seen here and there with the parents since 2014; wn.be).

- Several additional alien (usually ephemeral) species of *Rumex* L. have recently been recorded: *R. confertus* Willd. (known from Mechelen and Sint-Niklaas since 2019; wn.be), *R. cristatus* DC. (occasionally observed but rarely typical; wn.be), *R. fueginus* Phil. [syn.: *R. maritimus* L. subsp. *fueginus* (Phil.) Hultén] (see also below) and *R. pseudonatronatus* (Borbás) Murb. (as grain alien in the Antwerp port and in Moen in 2011; wn.be).

R. stenophyllus Ledeb. has been known as an alien but it is seen quite regularly these days, especially in port areas (Verloove 2008b, Verloove 2013a). It went unnoticed for a long time due to confusion with *R. ×pratensis*. It is distinguished from the hybrid by its fruiting valves that all bear a callus (these equal to each other), its lower leaves with attenuate or truncate base and, of course, its fertility.

- *R. acetosella* L.: two subspecies that are distinguished in NF6 [subsp. *acetosella* and subsp. *pyrenaicus* (Pouret ex Lapeyr.) Akeroyd] are probably of limited taxonomic value (mere morphotypes?) (FG, H24).

- *R. salicifolius* Weinm. var. *triangulivalvis* (Danser) Hickman: this North American taxon is usually accepted as a distinct species by contemporary American taxonomists (e.g. Mosyakin 2005), *R. triangulivalvis* (Danser) Rech. f. In western Europe it is usually referred to as *R. salicifolius* but this species has a rather small native distribution range and does not occur as an alien outside this range.

- *R. pulcher* L.: the plants that are possibly native in the southernmost part of the Flora area belong to subsp. *pulcher* (FG).

- *R. obtusifolius* L. subsp. *sylvestris* (Wallr.) Čelak.: this rare alien is recognizable by its very small valves with almost entire margins, all with a callus.

- *R. maritimus* L.: a very similar American species, *R. fueginus* Phil. [syn.: *R. maritimus* subsp. *fueginus* (Phil.) Hultén], has been found in Mar. since 2011 (on exposed wet sands) but appears to be unstable. Due to its similarities with *R. maritimus* it might be overlooked. Its leaves (at least the basal ones) have distinctly wavy margins and the base is truncate-cordate. The plant is densely papillose (especially the underside of the leaves and the branches of the inflorescence) and turns dark brown when ripe. At least some valves have three teeth instead of two.

- *Polygonum oxyspermum* C.A. Mey. et Bunge ex Ledeb. subsp. *raii* (Bab.) D.A. Webb et Chater: this taxon is now treated as a distinct species, *P. raii* Bab., following e.g. FG.
- The generic limits of *Persicaria* Mill. have considerably changed as a result of recent molecular phylogenetic studies (Galasso *et al.* 2009). The following two genera were segregated: *Bistorta* Hill (with the native species *B. officinalis* Delarbre and some garden ornamentals) and *Rubrivena* M. Král [with the naturalized alien *R. polysachya* (Wall. ex Meissner) M. Král].
- In NF6, it was said that species of *Persicaria* Mill. hybridize rather easily. This is a gross overestimation: such hybrids must be exceedingly rare (see also FG, Stace *et al.* 2015, Stace 2019) and most claims are doubtlessly erroneous.
- The cultivated ornamental *Bistorta affinis* (D. Don) Greene [syn.: *Persicaria affinis* (D. Don) Ronse Decraene] has occasionally been observed as an escape (wn.be).
- The generic limits of *Fallopia* Adans. have changed as a result of molecular phylogenetic studies (Galasso *et al.* 2009). In a strict sense, this genus only includes species with twining stems, the others are now accommodated in *Reynoutria* Houtt. On the other hand, hybridization occasionally occurs between representatives of these genera [for instance between *Fallopia baldschuanica* (Regel) Holub and *Reynoutria japonica* Houtt.; see also below], which confirms their close affinity.
- *F. aubertii* (L. Henry) Holub and *F. baldschuanica* (Regel) Holub: these species are probably conspecific, the latter binomial having nomenclatural priority (see also FG, H24, Stace 2019).
- An intergeneric hybrid between *Fallopia baldschuanica* (Regel) Holub and *Reynoutria japonica* Houtt., ×*Reylopia conollyana* (J.P. Bailey) Galasso (syn.: *Fallopia conollyana* J.P. Bailey) has very rarely been observed (especially in Fl.). This plant resembles *R. japonica* in its habit, but its stems are a little thinner and incline more strongly and the apex of its leaves is acuminate. This hybrid was also cultivated from seeds collected from *R. japonica*, thus following pollination of the latter by *F. baldschuanica* (Hoste *et al.* 2017).

126. Caryophyllaceae

- Recent molecular phylogenetic studies have greatly modified generic limits in Caryophyllaceae (see below). The casual alien *Silene coeli-rosa* (L.) Godr. is now accommodated in a separate genus, as *Eudianthe coelirosa* (L.) Fenzl.
- An additional ephemeral (?) alien was recently observed, *Paronychia argentea* Lam. It was found, among others, in two campsites (Antwerpen-Linkeroever, De Panne), since 2017 (Verloove *et al.* 2020a).
- *Arenaria serpyllifolia* L.: the two subspecies that were distinguished in NF6, subsp. *serpyllifolia* and subsp. *leptoclados* (Reichenb.) Nyman, are now treated as two

distinct species, *A. serpyllifolia* s.str. and *A. leptoclados* (Reichenb.) Guss., following other contemporary flora accounts (e.g. FG, H24, Stace 2019).

A. serpyllifolia s.str. is a very variable species within which three varieties were distinguished in NF6 that are linked by intermediates (and therefore probably of limited taxonomic value; see also FG). The correct name for var. *lloydii* (Jord.) Lloyd is var. *macrocarpa* Lloyd.

- *Minuartia hybrida* (Vill.) Schischkin and *M. mediterranea* (Link) K. Malý: some recent studies, corroborated by molecular data (e.g. Dillenberger & Kadereit 2014), place these two species in a separate genus, *Sabulina* Reichenb., a point of view already followed by some contemporary western European Floras, e.g. H24 and Stace (2019). The corresponding names in that genus [respectively *S. tenuifolia* (L.) Reichenb. and *S. mediterranea* (Link) Reichenb.] were added, as synonyms.

- *Minuartia hybrida* (Vill.) Schischkin: this is a very variable species that seems to be represented in the Flora area by three subspecies. Most often the sepals and pedicels are glabrous [subsp. *tenuifolia* (L.) Kerguelén]. Much more rarely, sepals and pedicels are glandular; such plants probably correspond with subsp. *hybrida*. Plants with flowers with 3-5 stamens (vs. 6-10) and petals much shorter than sepals (vs. nearly equalling sepals) can be attributed to subsp. *laxa* (Jord.) Jauzein (syn.: *M. laxa* Jord.) (FG). The distribution and frequency of these three taxa remain to be assessed, although the last subspecies may be only adventitious in the Flora area (in France it predominantly occurs in the southeastern part; SI-Flore). It was also observed in Brussels (wn.be) and in the Dunkerque area (pers. obs. FV). Duluc (2019) also confirmed its presence in north-western France.

- An alien, ephemeral *Stellaria* L. was recently recorded: *S. media* (L.) Vill. subsp. *cupaniana* (Jord. et Fourr.) Nyman [syn.: *S. cupaniana* (Jord. et Fourr.) Bég.] (Antwerp port, 2013, as grain alien; wn.be). It was previously also noticed as a weed in plant containers (Hoste *et al.* 2009).

- *S. media* (L.) Vill.: two subspecies that were distinguished in NF6, subsp. *media* and subsp. *neglecta* (Weihe) Gremlí, are now treated as two distinct species, *S. media* s.str. and *S. neglecta* Weihe, in accordance with other contemporary western European flora accounts (FG, H24, Stace 2019).

- A cryptic species, very similar to *S. media* (L.) Vill., was recently described from the Czech Republic, *S. ruderalis* M. Lepší, P. Lepší, Z. Kaplan et P. Koutecký (Lepší *et al.* 2019). It is a tetraploid species, possibly resulting from hybridization between *S. pallida* (Dum.) Piré and *S. neglecta* Weihe. The plant is robust, up to 80 cm tall, ± yellowish green; early inflorescences are usually condensed, the first internodes of the dichasium branches are almost equal to each other; petals are shorter than or as long as sepals; stamens 3-5 (-10) in number; seeds light brown to dark brown, with long, conical tubercles which are longer than wide, with few or absent papillae. This

species is very widespread in Central and southern Europe and was found in Mosan or. in Aachen (Germany) (Bomble 2020) and near Genk in Camp. or. (wn.be). It should be sought elsewhere in the territory of the Flora, especially in its eastern part.

- *S. holostea* L.: molecular phylogenetic studies have shown that this species constitutes a monotypic entity that was resolved as sister to the clade containing *Stellaria* L. + *Cerastium* L. It was therefore transferred to a new genus, *Rabelera* (L.) M.T. Sharples et E. Tripp (Sharples & Tripp 2019). Its corresponding name in that genus, *R. holostea* (L.) M.T. Sharples et E. Tripp was added, as a synonym.

- *Cerastium fontanum* Baumg. subsp. *vulgare* (Hartm.) Greuter et Burdet var. *holosteoides* (Fries) Jalas: this variety is poorly known in the territory of the Flora. It was always believed to be absent in Belgium; in fact, it is probably the native taxon of depressions in coastal dunes. It is present in the permanent seed bank and is observed each time this bank is exposed. However, as soon as the ubiquitous var. *vulgare* appears – often anthropogenically introduced – seemingly intermediate plants are observed, rapidly replacing var. *holosteoides* (comm. M. Leten, 08.2020). It should be noted, however, that the taxonomic value of this variety is debatable: FG merely ignores it whereas H24 and Stace (2019) accept it at a more elevated rank (as subspecies).

- *C. brachypetalum* Desp. ex Pers.: the taxonomic value of the two subspecies distinguished in NF6, based on the presence or absence of glandular hairs, is probably limited (individual variation; FG).

- *C. pumilum* Curt.: two subspecies that were distinguished in NF6 were reduced to variety rank [var. *pumilum* and var. *glutinosum* (Fries) Beck], although there is some disagreement among recent authors. FG and H24, for instance, accepted both as distinct species. According to a detailed study by Letz *et al.* (2012) both differ in ploidy number and in a number of morphological features, at least some of them not mentioned in NF6. The key was improved accordingly. A traditionally used character (presence vs. absence of a scarious margin to the tip of the lowermost bracts) was shown to be not taxonomically informative by these authors.

- *Sagina subulata* (Swartz) C. Presl is an illegitimate name; the correct name for this species is *S. alexandrae* Iamonico (Iamonico 2016).

- A new alien species of *Sagina* L. was recently observed, *S. japonica* (Swartz) Ohwi (Antwerp port, 2018; introduced with rice).

- *Spergularia* (Pers.) J. et C. Presl: some recent molecular phylogenetic studies have advocated the inclusion of this genus in *Spergula* L. (e.g. Fior *et al.* 2006, López González 2010) and this point of view was followed by e.g. FG. Further studies, however, have shown that both genera are monophyletic entities (Kool & Thulin 2017). Both genera were thus maintained but synonyms in *Spergula* were added for all species of *Spergularia*.

- An additional alien species of *Spergularia* (Pers.) J. et C. Presl was recently observed: *S. bocconeii* (Scheele) Asch. et Graebn. [syn.: *Spergula bocconeii* (Scheele) Pedersen] (as campsite alien in Bredene in 2016-2017; Verloove *et al.* 2020a).

- *Delia segetalis* (L.) Dum.: all recent Floras (e.g. FG, H24) treat this as a species of *Spergularia* (Pers.) J. et C. Presl., *S. segetalis* (L.) G. Don f., which is corroborated by several molecular studies.

- A character useful for the separation of *S. media* (L.) C. Presl and *S. marina* (L.) Besser was added: stamens usually 8-10 and 1-6 respectively (FG, H24; comm. P. Van Vooren).

- The representatives of the former genus *Lychnis* L. were transferred to other genera. *L. viscaria* L. is now accommodated in *Viscaria* Bernh. (as *V. vulgaris* Bernh.), whereas *L. flos-cuculi* L. and two ornamentals [*L. coronaria* (L.) Desr. and *L. chalconica* L.] were transferred to *Silene* L. [*S. coronaria* (L.) Clairv. and *S. chalconica* (L.) E.H.L. Krause] (based on Jafari *et al.* 2020).

- The correct name for a species of *Agrostemma* L. that is regularly sown (and observed as an escape) in the Flora area is *A. brachyloba* (Fenzl) K. Hammer, not *A. gracile* Boiss. (e.g. H24). It is recognizable by its calyx teeth that not protrude from the petals.

- The generic limits of *Silene* L. have considerably changed, as a result of recent molecular phylogenetic studies (summarized by e.g. Jafari *et al.* 2020). In addition to some species of *Lychnis* L. that have been transferred to it (see before), the genus now also includes *S. baccifera* (L.) Durande (formerly in the segregate genus *Cucubalus* L.). *S. armeria* L., on the contrary, was removed from it and is now accommodated in *Atocion* Adans., as *A. armeria* (L.) Rafin.

- *Silene vulgaris* (Moench) Garcke subsp. *maritima* (With.) Á. et D. Löve: this subspecies is now treated as a distinct species, *S. uniflora* Roth, following FG. It is usually readily separated from *S. vulgaris*, much more so than the other infraspecific taxa that are usually accepted under the latter.

- *S. nutans* L.: this species is very variable and very probably consists of a complex of different species. The populations present in the territory of the Flora correspond to two different biological types that are forming non-viable or sterile hybrids. They differ in particular in the structure of the inflorescence, the number and color of the flowers and the size of the capsules (Somme *et al.* 2016, Van Rossum 2000); they correspond with calcicolous and silicicolous ecotypes that are cooccurring in the valley of river Meuse and its tributaries. A coherent taxonomic system remains to be developed.

- *S. coronaria* (L.) Clairv.: this ornamental species is very easily escaping, to such an extent that it has naturalized here and there in the Flora area. It was therefore added to the key and a full account was presented.

127. Amaranthaceae

- An additional ephemeral alien species was recently recorded: *Teloxys aristata* (L.) Moq. (syn.: *Chenopodium aristatum* L.) (Ghent port area, 2016, as grain alien; wn.be).

- The generic limits in Amaranthaceae (especially in ex-Chenopodiaceae) have considerably changed as a result of molecular phylogenetic studies (see also below). Two ephemeral aliens that were already mentioned in NF6 were transferred to other genera: *Bassia hirsuta* (L.) Aschers. is now *Spirobassia hirsuta* (L.) Freitag et G. Kadereit; *Monolepis nuttalliana* (Schult.) Greene is now *Blitum nuttallianum* Schult. (Kadereit & Freitag 2011, Fuentes-Bazan *et al.* 2012).

- *Amaranthus blitum* L.: in NF6, it was said that some of the plants belong to subsp. *emarginatus* (Moq. ex Uline et Bray) Carretero, Muñoz Garmendia et Pedrol. In fact, at least part of the naturalized populations, especially in Fluv. (river Maas), correspond to this subspecies. It appears to be a recently expanding taxon.

- *Salicornia europaea* L. subsp. *europaea* and subsp. *disarticulata* (Moss) Lambinon & Vanderpoorten: these two subspecies often hybridize and this hybrid was named *S. europaea* subsp. *europaea* n. subsp. *marshallii* Lambinon et Vanderpoorten. This concept is in line with molecular phylogenetic studies (Kadereit *et al.* 2012). In the British Isles, however, these two subspecies are still recognized as distinct species (Stace 2019) and their hybrid was recently formally named, *S. ×marshallii* (Lambinon et Vanderpoorten) Stace (Stace 2015).

- *S. procumbens* Smith: two varieties recognized in NF6, var. *procumbens* and var. *stricta* (G.F.W. Mey.) J. Duviigneaud et Lambinon, are well separated on morphological grounds and accepted as distinct species by some authors. However, genetically they are indistinguishable (Kadereit *et al.* 2012).

- *Polycnemum arvense* L.: this species is distinguished from *P. majus* A. Braun by tepals and fruits less than 1.6 mm long, bracteoles less than 2 mm long and median and upper floral leaves less than 5 mm long. It has recently been found in several localities in Lorr. (e.g. in a railway yard in Mont-sur-Meurthe, also in Piennes) and may naturalize locally (Weicherding 2011, FLORAINE 2013, Vernier 2020).

- The generic circumscription of *Salsola* L. has considerably changed, as a result of recent molecular phylogenetic studies (e.g. Akhani *et al.* 2007, Wen *et al.* 2010). Our native species *Salsola kali* L. was transferred to *Kali* Mill., as *K. soda* Moench. Its subsp. *tragus* (L.) Čelak. is now treated as a distinct species by most recent authors, *K. tragus* (L.) Scop. (e.g. FG, H24). In FG, this species was accepted under the binomial *K. australis* (R. Br.) Akhani et E.H. Roalson. The latter, however, is an Australian endemic species (also locally naturalized in southwestern North America and southern Africa) whereas the most widespread and often weedy species of ‘*Salsola*’ is now

properly known as *K. tragus* due to its lectotypification and epitypification (Rilke 1999, Mosyakin 2018).

- The generic limits of *Chenopodium* s.l. and related taxa have considerably changed as a result of recent molecular phylogenetic studies (see Fuentes-Bazan *et al.* 2012 for an overview). *Dysphania* R. Br. (for species with aromatic, glandular hairs) had already been segregated before on morphological grounds (Mosyakin & Clemants 2002) and this is confirmed by molecular data. *Chenopodium*, as traditionally understood, finally turns out to fall apart in seven distinct genera and the Belgian representatives, native as well as non-native, are now classified as follows (species preceded by an * are non-native in Belgium):

- *Lipandra* Moq. with a single, native species: *L. polysperma* (L.) S. Fuentes, Uotila et Borsch (syn.: *Chenopodium polyspermum* L.);

- *Oxybasis* Kar. et Kir., with 6 species (4 native, 2 non-native species): *O. chenopodioides* (L.) S. Fuentes, Uotila et Borsch [syn.: *Chenopodium chenopodioides* (L.) Aellen], *O. glauca* (L.) S. Fuentes, Uotila et Borsch (syn.: *Chenopodium glaucum* L.), **O. macrosperma* (Hook. f.) S. Fuentes, Uotila et Borsch (syn.: *Chenopodium macrospermum* Hook. f.), *O. rubra* (L.) S. Fuentes, Uotila et Borsch (syn.: *Chenopodium rubrum* L.), **O. salina* (Standley) Uotila (syn.: *Chenopodium salinum* Standley) and *O. urbica* (L.) S. Fuentes, Uotila et Borsch (syn.: *Chenopodium urbicum* L.);

- *Blitum* L., with a single native and three non-native species: *B. bonus-henricus* (L.) Reichenb. (syn.: *Chenopodium bonus-henricus* L.), **B. capitatum* L. [syn.: *Chenopodium capitatum* (L.) Ambrosi], **B. nuttallianum* Schult. [syn.: *Monolepis nuttalliana* (Schult.) E. Greene] and **B. virgatum* L. (syn.: *Chenopodium foliosum* Aschers.);

- *Dysphania* R. Brown, with nine non-native species: **D. ambrosioides* (L.) Mosyakin et Clemants (syn.: *Chenopodium ambrosioides* L.), **D. botrys* (L.) Mosyakin et Clemants (syn.: *Chenopodium botrys* L.), **D. carinata* (R. Brown) Mosyakin et Clemants (syn.: *Chenopodium carinatum* R. Brown), **D. cristata* (F. Muell.) Mosyakin et Clemants [syn.: *Chenopodium cristatum* (F. Muell.) F. Muell.], **D. glomulifera* (Nees) P.G. Wilson [syn.: *Chenopodium myriocephalum* (Benth.) Aellen], **D. multifida* (L.) Mosyakin et Clemants (syn.: *Chenopodium multifidum* L.), **D. pseudomultiflora* (J. Murr) Verloove et Lambinon [syn.: *Chenopodium pseudomultiflorum* (J. Murr) Uotila], **D. pumilio* (R. Brown) Mosyakin et Clemants (syn.: *Chenopodium pumilio* R. Brown) and **D. schraderiana* (Schult.) Mosyakin et Clemants (syn.: *Chenopodium schraderianum* Schult.);

- *Teloxys* Moquin-Tandon, with a single non-native species: **T. aristata* (L.) Moq. (syn.: *Chenopodium aristatum* L.);

- *Chenopodiastrum* S. Fuentes, Uotila & Borsch, with two native and one non-native species: *C. hybridum* (L.) S. Fuentes, Uotila et Borsch (syn.: *Chenopodium hybridum* L.), *C. murale* (L.) S. Fuentes, Uotila et Borsch (syn.: *Chenopodium murale* L.) and **C. simplex* (Torrey)

S. Fuentes, Uotila et Borsch [syn.: *Chenopodium simplex* (Torrey) Raf.].

The remaining species belong in *Chenopodium* s.str. In this new, narrower circumscription this genus is monophyletic.

- Some ephemeral alien species of *Chenopodium* L. s.str. were renamed. *C. bushianum* Aellen is treated as a variety of *C. berlandieri* Moq. [var. *bushianum* (Aellen) Cronquist] and the species called *C. desiccatum* A. Nelson in NF6 is now called *C. pratericola* Rydberg by contemporary North American authors (Clemants & Mosyakin 2003).

- A hybrid between *C. album* L. and *C. giganteum* D. Don (*C. ×reynieri* A. Ludw. et Aell.) is frequently cultivated nowadays (almost always under the wrong name of *C. giganteum*) and is sometimes found as an escape from cultivation (wn.be).

- The species of the *C. album* L. complex (*C. giganteum* D. Don, *C. missouriense* Aell., *C. opulifolium* Schrad. ex Koch et Ziz, *C. probstii* Aell., etc.) are all hexaploids, which would probably justify their amalgamation. The problem requires further study.

C. album subsp. *striatum* (Krašán) J. Murr, on the contrary, is a tetraploid that is better treated as a distinct species, *C. strictum* Roth. (see, however, below).

- *C. opulifolium* Schrad. ex Koch et Ziz is closely related to *C. album* L. (see above) and sometimes treated as a subspecies of it (e.g. in FG), subsp. *opulifolium* (Schrad. ex Koch et Ziz) Batt. This name was added, as a synonym.

- *C. berlandieri* Moq.: a variety with larger seeds (1.7–2 mm wide) and a slightly drooping inflorescence, var. *bushianum* (Aellen) Cronquist (syn.: *C. bushianum* Aellen), has been found in the past as an ephemeral alien.

- *C. strictum* Roth: this binomial has been misapplied. The name *C. betaceum* Andrz. should be applied to most of the European and western Asian plants currently called *C. strictum* sensu auct. The true *C. strictum* Roth belongs to a group of insufficiently known taxa from India and adjacent areas, and is not closely related to *C. betaceum* (Mosyakin 2017).

- *Lipandra polysperma* (L.) S. Fuentes, Uotila et Borsch: in NF6 (under *Chenopodium polyspermum* L.), two varieties were recognized [var. *polyspermum* and var. *acutifolium* (Smith) Gaudin] but these are probably only morphoses (resulting from autumn conditions?) without taxonomic value (see also FG). They were suppressed.

- *Oxybasis rubra* (L.) S. Fuentes, Uotila et Borsch: two varieties were distinguished in NF [under *Chenopodium rubrum* L.: var. *rubrum* and var. *humile* (Hook.) S. Watson]. These are sometimes well characterized, but probably of little taxonomic value. A third variety, var. *blitoides* (Lej.) Wallr., is not recombined yet under *Oxybasis* and there is little point in doing so as no one seems to recognize this taxon any longer.

- In Lorr. mér. and or. (e.g. in Dieulouard but also east of

Château-Salins, just beyond the Flora limits; formerly also in the southern part of the Grand-Duchy of Luxembourg) plants have been observed with characters intermediate between *O. rubra* and *O. urbica*. Such plants are usually ascribed to *O. rubra* var. *intermedia* (Mert. et W.D.J. Koch) B. Bock et Tison (e.g. FG) but it is possibly a distinct allotetraploid species, resulting from a hybridization between these species, for which the name *C. rhombifolium* Willd. is available (Wisskirchen & Weicherding 2020) (species not yet recombined under *Oxybasis*).

- The ephemeral alien species *Atriplex sibirica* L. is accommodated in *Obione* Gaertn. by some authors. Its name in that genus [*Obione sibirica* (L.) Fisch.] was added, as a synonym.

128. Aizoaceae

- Some species from this family are increasingly grown as ornamentals and some are rarely found as escapes from cultivation, e.g. several species of the genus *Delosperma* N.E. Brown (?*D. aberdeenense* (L. Bolus) L. Bolus, ?*D. cooperi* (Hook.f.) L. Bolus) and *Drosanthemum floribundum* (Haworth) Schwantes (Genk, 2018) (wn.be). Assessing their identity is rarely straightforward, most plants in horticulture possibly being cultivars or hybrids.

- The specific epithet of *Tetragonia tetragonoides* (Pallas) O. Kuntze was misspelt in NF6 (“tetragonioides”). See article 60.8, Ex. 23 of the Code.

129. Phytolaccaceae

- *Phytolacca acinosa* Roxb.: the taxonomic view of NF6 for this complex was maintained, contrary to FG. *P. acinosa* is treated as a collective species that includes, among others, *P. esculenta* Van Houtte. This is in accordance with e.g. H24, Stace 2019, Jäger *et al.* 2008).

132. Montiaceae

- The correct name for the species called *Montia minor* C.C. Gmel. in NF6 is *M. arvensis* Wallr. (FG, H24, Florenliste Buttler).

- The taxonomic framework of the *M. fontana* complex was changed. The subspecies *variabilis* Walters and *amporitama* Sennen of the latter, as recognized in NF6, are now considered to be a separate species, *M. hallii* (A. Gray) Greene, the latter itself with two varieties, var. *hallii* and var. *variabilis* (Walters) Holub (although the taxonomic value of these varieties may be limited; FG).

133. Portulacaceae

- *Portulaca oleracea* L.: this species has been subdivided into a series of subspecies, based essentially on seed size and ornamentation, and several infraspecific taxa have been identified in the Flora (Danin & Verloove 2015). However, genetic studies have shown that *P. oleracea* should be considered as a polymorphic species, indivisible into microspecies on the basis of seed ornamentation and size (El-Bakatoushi *et al.* 2013).

136. Cornaceae

- *Cornus sanguinea* L.: in addition to the two subspecies that are currently found in the Flora area, one native (subsp. *sanguinea*) and one introduced [subsp. *australis* (C.A. Mey.) Jáv. ex Soó], intermediate plants have also been encountered. These are believed to be their hybrid, nsubsp. *hungarica* (Kárpáti) Soó.

138. Polemoniaceae

- Two further ornamental species are occasionally recorded as casual escapes from cultivation: *Gilia capitata* Sims and *Phlox paniculata* L. (wn.be).

139. Primulaceae

- Two additional species of *Primula* L. have recently been observed as ephemeral escapes: *P. denticulata* Sm. (Sourbrodt, 2016-2018; wn.be) and *P. florindae* Kingdon-Ward (Koerselse Heide, 2010; wn.be).

- *P. veris* L.: the taxonomic value of subsp. *columnae* (Ten.) Maire et Petitmengin is probably limited, it was reduced to variety rank, var. *columnae* (Ten.) B. Bock (see also FG).

- The generic limits of *Lysimachia* L. and related genera have dramatically changed in recent times, as a result of molecular phylogenetic studies. Hao *et al.* (2004) already showed that *Glaux* L. is deeply nested in *Lysimachia*. More numerous data sets used by Anderberg *et al.* (2007) confirmed this and demonstrated that, among others, *Anagallis* L. (incl. *Centunculus* L.) and *Trientalis* L. are also completely nested in *Lysimachia*. Manns & Anderberg (2009) made the corresponding nomenclatural transfers. Despite being morphologically fairly aberrant, this new generic concept has since then been applied by many authors (e.g. Banfi & Galasso 2005, FG; see however H24). Stace (2010), who initially classified the amalgamation of *Anagallis* and *Lysimachia* as an “unwelcome newcomer”, eventually also treated *Lysimachia* in a broad sense (Stace 2019).

- *L. europaea* (L.) U. Manns et Anderb.: in NF6 (key), this species was said to usually have fruits with 7 valves. In reality, this number is rather variable and ranges between 5 and 9 (FG, H24, Stace 2019).

- Several species of the genus *Lysimachia* L. are cultivated for ornamental purposes. At least *L. clethroides* Duby (observed in very few localities since 2016) and *L. fortunei* Maxim. (Ploegsteert, 2015), both with white flowers in dense spikes, have recently been recorded as escapes from cultivation (wn.be).

- *L. punctata* L.: the plants that are found naturalized in the territory of the Flora are rather variable. Two morphotypes are observed: on the one hand, plants with a loose inflorescence with flowers with pedicels up to 25 mm long and with clearly petiolated leaves (petiole up to 20 mm long); on the other hand, plants with a dense inflorescence with (sub-) sessile flowers and with almost sessile leaves. These plants would correspond respectively to *L.*

verticillaris Spreng. and *L. punctata* s.str., the first morphotype being more frequent. However, plants with more or less intermediate morphology are also observed. It is very likely that our populations of *L. punctata* represent in fact hybrids which lean sometimes towards the one, the other time towards the other species.

- Two subspecies of *Anagallis arvensis* L. that were recognized in NF6, subsp. *arvensis* and subsp. *foemina* (Mill.) Schinz et Thell., are now treated as two distinct species of *Lysimachia*, *L. arvensis* (L.) U. Manns et Anderb. and *L. foemina* (Mill.) U. Manns et Anderb. respectively, which is in accordance with most other contemporary Floras (e.g. FG, Stace 2019; see however H24).

- The forms of *Anagallis arvensis* (as mentioned in NF6) have not yet been combined under *Lysimachia*, no doubt mostly because their taxonomic value is nihil. They were not recombined by us either.

- A further species of *Cyclamen* L., *C. coum* Mill., with spring flowering and more or less reniform leaves, is increasingly observed as an escape from cultivation, either as an ephemeral or locally naturalizing (wn.be).

142. Ericaceae

- Two further shrubby species of Ericaceae are grown as ornamentals and have been observed as escapes from cultivation: *Daboecia cantabrica* (Huds.) K. Koch (a small, more or less established population known from an anthropogenically disturbed heath in Keerbergen since 2012) and *Leucothoe fontanesiana* (Steud.) Sleumer (occasionally observed since 2011) (both wn.be).

- *Calluna vulgaris* (L.) Hull var. *hirsuta* (Waltz) S.F. Gray: this taxon is not listed in FG, Stace (2019), etc. and is also missing from databases such as Tropicos, Plantlist, IPNI. It is probably of limited taxonomic value. H24 treats this as a cultivar, rather than a variety.

- The hybrid *Erica* × *darleyensis* (*E. erigena* R. Ross × *carnea* L.) is often grown as an ornamental and has been recorded as an escape as well (wn.be).

- *Rhododendron ponticum* L.: some naturalized populations may be artificial hybrids involving *R. baeticum* Boiss. et Reut. [syn.: *R. ponticum* subsp. *baeticum* (Boiss. et Reut.) Hand.-Mazz.], native to the Iberian Peninsula, and North American species such as *R. catawbiense* Michaux, *R. maximum* L., and possibly also *R. macrophyllum* D. Don ex G. Don. The true *R. ponticum* is neither vigorous nor invasive. The invasive plant in the British Isles is thought to belong to a complex and variable hybrid, *R. ×superponticum* Cullen, a name that perhaps is applicable as well to the naturalized populations in the Flora area (see e.g. Chamberlain 1982, Milne & Abbott 2000, Cullen 2011, H24).

- *Vaccinium corymbosum* L.: the exact identity of the cultivated and escaped plants is not clear. Some plants rather correspond to *V. corymbosum*, others to *V. angustifolium* Ait. However, at least part of the plants are intermediate in morphology and probably belong to their

hybrid (Kowarik & Schepker 1995, Schepker *et al.* 1997, Schepker & Kowarik 1998, H24, Adriaens *et al.* 2019).

144. Rubiaceae

- A second species of the genus *Rubia* L., *R. peregrina* L., is native just to the south of the territory covered by the Flora and is very rarely observed within its limits, in Champ. mér. (for instance near Châlons-en-Champagne; database CBN Paris). It differs from *R. tinctoria* by its leathery leaves that lack prominent lateral veins.
- *Galium rotundifolium* L. was found in the extreme southern part of the Flora territory, near Troyes (Champ.) (SI-Flore) and it may also occur in Lorr. (Vernier 2020 reports it from the northern Plateau Lorrain). It resembles *G. boreale* L. but its leaves are broadly oval to elliptical and the fruit hairs are usually at least 0.4 mm long at maturity. This species is probably naturalized rather than native to this region (FG).
- *G. murale* (L.) All.: although a very recent newcomer in the Flora area, this thermophilous species has established itself in few years' time. It is locally naturalized now, especially in urban habitats and in campsites (Verloove *et al.* 2020a). It was added to the key and a full account is presented.

145. Gentianaceae

- *Gentiana asclepiadea* L. was recorded once, in 1961, as an exceptional and ephemeral alien, probably an escape from or relic of cultivation, in Waimies in the Hautes Fagnes (Mont Rigi) (herbarium Meise Botanic Garden).
- In NF6, *G. cruciata* L. was said to be a herbaceous chamaephyte, which is not correct. It is a hemicryptophyte (based on comm. B. Toussaint and E. Bertiaux, 12.2021; compare also with FG).
- In the key to *Gentianella* Moench, flowers are said to be usually 5-merous in *G. amarella* (L.) Börner, less often 4- or 6-merous. In Flemish populations of this species, however, a majority of the individuals have 4-merous flowers (comm. M. Leten, August 2022).
- *G. amarella* (L.) Börner: there is no longer any doubt that this species in fact includes two distinct species, even if the differences are morphologically minor (Greimler *et al.* 2004). It is, however, still unclear to which species the plants from the Flora area belong. FG only accepts *G. amarella* s.str. from France, whereas in the Netherlands *G. uliginosa* (Willd.) Börner appears to be the least rare of both species (H24). This issue requires further study.
- *G. ciliata* (L.) Borkh.: this species is now accommodated in a segregated genus, *Gentianopsis* Ma, as *G. ciliata* (L.) Ma. Its placement in that genus was corroborated by molecular phylogenetic studies (Yuan & Kupfer 1995) and is accepted by contemporary Floras in western Europe (e.g. FG, H24, Stace 2019).

146. Apocynaceae

- An additional ephemeral alien was recently observed:

Gomphocarpus fruticosus (L.) W.T. Aiton (syn.: *Asclepias fruticosa* L.) (Roeselare, 2017; wn.be).

- The alleged presence in the Flora area of hybrids between *Vinca major* L. and *V. minor* L. (as per NF6) appears to be very unlikely. Although both species are often found growing together, such hybrids do not seem to exist (compare with Stace *et al.* 2015).

147. Boraginaceae

- Some representatives of the genus *Nemophila* Nutt. are grown as ornamentals and are sometimes observed as escapes: *N. maculata* Benth. ex Lindl. and *N. menziesii* Hook. et Arnott (wn.be).
- *Brunnera macrophylla* (Adams) I.M. Johnston is cultivated for ornament and often confused with *Omphalodes verna* Moench. It is observed as an escape in similar habitats and tends to naturalize locally (wn.be). It differs from this last species by its smaller corollas (only 3-4 mm across) and by the absence of stolons.
- Contrary to NF6, *Amsinckia micrantha* Suksd. is not the sole species of this genus that is recorded these days in the Flora area. A small population of *A. lycopsoides* Lehm. ex Fisch. et C.A. Mey. has been known from a railway siding in Wasmes-Audeméz-Briffoeil since 2018 (wn.be) and a further species of the genus, *A. intermedia* Fisch. et C.A. Mey., has been recorded as grain alien in the Ghent port area since 2019 (wn.be).
- *A. micrantha* Suksd.: the exact identity of the species that is locally naturalized in the Flora area remains uncertain. Some authors (e.g. FG, Juan 2012) ascribe these plants to a similar-looking South American species, *A. calycina* (Moris) Chater. However, this last species has smaller achenes (2 mm only) and very narrow leaves (Brand 1931). At least for the time being, the name *A. micrantha* is maintained but future monographic studies in the New World may shed new light on this issue.
- The generic circumscription of *Lithospermum* L. has changed, resulting from molecular phylogenetic studies. In the Flora area, it now only includes *L. officinale* L. Two others, *L. arvense* L. and *L. purpureocaeruleum* L., have been transferred to *Buglossoides* Moench (compare with FG). Alternatively, *Lithospermum* could have been further segregated to accommodate the latter in *Aegonychon* Gray, like was done by Stace (2019) or, pending further studies, retained in a broad sense (as per H24).
- An additional alien species of *Pulmonaria* L. is sometimes grown as an ornamental and has been recorded as an escape, *P. rubra* Schott (Erpe, 2015-2016; wn.be).
- *P. mollis* Wulfen ex Hornem.: this species is easy to recognize due to its indument (presence of long and dense glands). However, it is probably not well known because of its resemblance with *P. montana* Lej. According to a recent study the whole *P. mollis* + *alpigena* + *collina* assemblage is entirely derived from a single, relatively recent hybridization of *P. montana* (female) and *P. obscura* (male), followed by allopolyploidy (Meeus *et al.* 2016).

- *Cynoglossum amabile* Stapf & J.R. Drumm is cultivated for ornamental purposes in parks and gardens (sown especially in ‘wild flower seeds’). This species with sky-blue flowers (except cultivars) is sometimes observed as a casual escape from cultivation (wn.be).

- *C. germanicum* Jacq.: the taxonomic value of two subspecies distinguished in NF6 is probably weak (FG).

- A further species of *Symphytum* L. is occasionally observed as an escape from cultivation, *S. orientale* L. (Mol, 2020; wn.be). It is characterized by its calyx that is incised for less than half of its length, its leaves that are all non-decurrent and its white corollas.

- *S. officinale* L.: it was believed that besides subsp. *officinale* a second subspecies would exist in the Flora area, subsp. *uliginosum* (A. Kerner) Nyman. The latter is confined to riparian habitats in central and eastern Europe and allegedly would be present in Fluv. in the Netherlands. However, in reality these plants refer to hybrid populations in which it is impossible to distinguish two taxa (H24).

From the same complex, FT further distinguishes *S. bohemicum* F.W. Schmidt [syn.: *S. officinale* subsp. *bohemicum* (F.W. Schmidt) Celak.], which is also said to occur in the Flora area (Ard. or. and Lorr. nord-or., both in Germany). Other Floras usually consider this to be a mere synonym of *S. officinale* (e.g. FG, E+M Plantbase, etc.). Phylogenetic studies have shown that they are indeed synonyms (Hacıoğlu & Erik 2011). The name, as a synonym, was added.

- *Myosotis discolor* Pers.: the two subspecies that were recognized in NF6 [subsp. *discolor* and subsp. *dubia* (Arrondeau) Blaise] are now treated as two distinct species, *M. discolor* s.str. and *M. dubia* Arrondeau, following FG. Dirkse *et al.* (2022) thoroughly emphasized the differences between Dutch and German accessions of diploid *M. dubia* and hexaploid *M. discolor*.

- *Anchusa officinalis* L.: the two subspecies that were recognized in NF6 [subsp. *officinalis* and subsp. *procera* (Besser) Lambinon] are now treated as distinct species, *A. officinalis* s.str. and *A. procera* Besser, following FG.

- *A. arvensis* (L.) Bieb.: this species was transferred again to *Lycopsis* L., the genus in which it was initially described, as *L. arvensis* L., following FG.

- An alien, ephemeral species of *Lycopsis* L. was recently observed, *L. orientalis* L. [syn.: *Anchusa arvensis* subsp. *orientalis* (L.) Nordh.; *A. ovata* Lehm.] (Ghent port area, 2019; wn.be).

- Several species of *Phacelia* Juss. are grown as ornamentals. One of them, *P. campanularia* A. Gray, is sometimes observed as an escape from cultivation (e.g. Egem, 2016; wn.be).

148. Convolvulaceae

- Some further ephemeral, alien species of Convolvulaceae have been recorded recently. *Dichondra argentea* Humb. & Bonpl. ex Willd. is an escape from cultivation in

urban areas (scattered records since 2015; wn.be). It has small silvery-gray, kidney-shaped leaves, creeping stems and tiny, deeply divided flowers.

In addition, a second species of *Dichondra* J.R. et G. Forst. was observed as an adventive, *D. micrantha* Urb. (Bilzen, on dredging sludge from river Scheldt, 2017; wn.be). The same species was recently also repeatedly recorded in the Dutch part of the Flora area: on the banks of river Maas in Grevenbicht (Fluv., 2020-2021) and in a lawn/roadside in Ospel (Camp., 2020) (wn.nl).

- The rare, ephemeral alien *Ipomoea coccinea* L. is now accommodated in a segregate genus, as *Quamoclit coccinea* (L.) Moench.

- *Calystegia* R. Brown is morphologically well separated from *Convolvulus* L. and forms a monophyletic group. However, molecular data have shown that it is in fact nested in the latter genus (Stefanović *et al.* 2003). It should therefore be included in it or *Convolvulus* further divided in several additional genera. Most recent western European Floras (e.g. FG, H24) have merged both genera, as was done in NF7. In a recent monograph of the genus *Convolvulus* (Wood *et al.* 2015), for pragmatic reasons, *Calystegia* was excluded from it.

- *Convolvulus sepium* L.: specimens of this species with a pink corolla, with whitish radial stripes belong, at least in part, to f. *colorata* (Lange) Dörfler (Verloove 2012b).

- *Cuscuta epilinum* Weihe was recently recorded as an ephemeral alien: in 2011 along river Maas in Maaswinkel and in 2013 in Grobbendonk, twice as a parasite on *Linum usitatissimum* L. (Barendse 2012, wn.be). The most recent records from Belgium dated back to 1938.

149. Solanaceae

- *Lycopersicon* Mill. was long warranted generic status (mainly based on anther morphology) but is in fact nested in *Solanum* L. according to several molecular phylogenetic studies (see Peralta *et al.* 2008 and references therein). *L. esculentum* Mill. was thus transferred (again) to *Solanum*, as *S. lycopersicum* L.

- An additional species of *Solanum* L., *S. pseudocapsicum* L., is rarely observed as an ephemeral escape from cultivation (since 2015; wn.be).

- The American weed *S. chenopodioides* Lam. seems to be naturalizing locally in urban habitats and port areas of Ghent and Antwerp (wn.be). It is very similar to *S. nigrum* L. but it is perennial (collar becoming woody and emitting sterile shoots), the inflorescence is umbellate (not cymose) and the ripe berries are dark purple to black-purple.

- *S. nigrum* L. subsp. *schultesii* (Opiz) Wessely: this subspecies is sometimes treated as a distinct species, for instance by Central European authors. Its name at species rank, *S. decipiens* Opiz, was added, as a synonym.

- *S. sarachoides* Sendtn.: this South American weed has locally naturalized in the Flora area. It was added to the key and a full account was presented.

- Two further alien species of *Nicotiana* L. have recently been observed: *N. langsdorffii* J.A. Weinm. as an ephemeral escape from cultivation (in scattered localities since 2015; wn.be) and *N. glauca* Graham (as a wool alien in Boorseem in 2011; wn.be).

150. Oleaceae

- *Fraxinus pennsylvanica* Marshall: two other similar-looking American ashes are also grown for ornamental purposes and have also been observed as escapes from cultivation. *F. americana* L. differs from *F. pennsylvanica* in having leaves with a whitish glaucous underside, *F. latifolia* Benth. in having lateral leaflets that are acute at apex (or abruptly acuminate) with petioles less than 2 mm long.

- *Syringa* L.: some further species are sometimes grown for ornament in parks and gardens, for instance *S. josikaea* J. Jacq. ex Reichenb. f. This species has been observed as an escape from or relic of cultivation, for instance in the Wolvenberg nature reserve in Berchem (wn.be).

- *Ligustrum* L.: in addition to *L. vulgare* L. and *L. ovalifolium* Hassk., several other species are grown for ornamental purposes, including their hybrid, *L. ×vicaryi* Rehd. The latter has also been observed as an escape from cultivation (wn.be). The identity of some of the other subsynchronous species, e.g. *L. sinense* Lour., should be verified.

152. Plantaginaceae

- Some additional, ephemeral aliens have recently been recorded, all as escapes from cultivation: *Chelone obliqua* L. (scattered records since 2011), *Ellisiophyllum pinnatum* (Wall. ex Benth.) Makino (Douvrain, 2016; comm. P. Dupriez), *Penstemon digitalis* Nutt. ex Sims (Lacuisine, 2019) and *Veronicastrum virginicum* (L.) Farw. (scattered records since 2015) (wn.be).

- An additional alien species of *Plantago* L. was recently observed, *P. sempervirens* Crantz. A small population persists since 2016 on a slag heap in Genk (wn.be).

- *P. cynops* L.: the proposal to reject this binomial was accepted by the latest Congress (Shenzhen Code Appendices).

- *P. major* L. subsp. *intermedia* (Gilib.) Lange: the correct name for this taxon at subspecies rank is subsp. *pleiosperma* Pilg. (see also FG).

- *Callitriche truncata* Guss.: it was thought that in the Flora area only subsp. *occidentalis* (Rouy) Braun-Blanq. was present. However, in 2011 subsp. *truncata* was discovered near Marquise (Delay & Petit 2011, Delay & Petit 2012) and its presence in that locality was recently confirmed (comm. B. Toussaint 06.2020; see also FG). A second locality, in Tardinghen, about eight kilometers from the first, was discovered recently (Duluc 2019). This subspecies is distinguished by its narrowly winged mericarps.

- *Veronica agrestis* group: the identification key was slightly improved. In *V. agrestis* L. hairs on capsules are predominantly but not exclusively glandular (comm.

I. Hoste). *V. opaca* L. and *V. polita* Fr. are perhaps best separated on sepal shape: sepals are widest at or above the middle and below the middle, respectively (FG, comm. I. Hoste). Contrary to what was stated in NF6, petals in *V. polita* and *V. opaca* can also be veined (comm. P. Van Vooren; see also FG).

- Some additional species of *Veronica* L. have recently been observed in the Flora area. *V. austriaca* L. and *V. repens* Clarion ex DC. (Oostakker, 2020) are escaped ornamentals (wn.be).

- *V. paniculata* L. and *V. urticifolia* Jacq.: these two species have been claimed from Belgium a very long time ago. Herbarium material is lacking, so these species were not upheld by Verloove (2006). This reference has become irrelevant and thus was removed.

- *V. hederifolia* L.: in accordance with most other contemporary western European Floras (e.g. FG, H24), the subspecies that were previously accepted in NF6 were raised to species rank, *V. hederifolia* s.str. and *V. sublobata* M. Fischer [syn.: *V. hederifolia* subsp. *lucorum* (Klett et Richt.) Hartl].

- *V. cymbalaria* Bodard: this Mediterranean weed has been observed quite regularly since 2015 (Hoste *et al.* 2016) and has locally naturalized (gardens, cemeteries). It was added to the key and a full account was presented. It looks like *V. hederifolia* L. s.l. but differs from it by its white corollas, hairy capsules and non-cordate sepals.

- *V. anagallis-aquatica* L.: in accordance with most other contemporary western European Floras (e.g. FG, H24, Stace 2019), the three subspecies that were previously accepted in NF6 were raised to species rank, *V. anagallis-aquatica* L. s.str., *V. catenata* Pennell and *V. anagaloides* Guss.

- The taxonomic and nomenclatural concept of the *V. austriaca* L./*V. teucrium* L. group remains insufficiently understood in the Flora area and very confusing. The complex consists of a series of recently diverged diploid-polyploid taxa in which delimiting species is quite challenging (Padilla-García *et al.* 2018). According to FG, the species that was called *V. prostrata* L. subsp. *scheereri* J.P. Brandt in NF6 should now be treated as a distinct species, *V. scheereri* (J.P. Brandt) Holub and the same applies to *V. teucrium* subsp. *vahlia* Gaudin that should now be called *V. orsiniana* Ten. However, this concept is not entirely in correspondence with the most comprehensive taxonomic revision of the group (*Veronica* subsection *Pentasepalae*; Rojas-Andrés & Martínez-Ortega 2016), resulting from recent phylogenetic analyses based on DNA sequence data and ploidy level information. *V. scheereri* is indeed best treated as a separate species and corresponds with what was called *V. prostrata* subsp. *scheereri* in NF6; its correct name, however, appears to be *V. satureiifolia* Poiteau & Turpin (Rojas-Andrés *et al.* 2016, as already pointed out much earlier by Hand 2003). Yet, the genuine identity of plants found in Fluv. in the Netherlands remains uncertain. Judging from the ecology and description (wn.

nl, verspreidingsatlas.nl, H24, Weeda *et al.* 1988), at least part of these plants may belong to *V. prostrata* s.str., a species from Central and eastern Europe (Rojas-Andrés & Martínez-Ortega l.c.). However, photos on wn.nl show a wide variety of forms, especially in terms of leaf characteristics. The problem thus requires further study in the Flora area.

The name *V. orsiniana*, on the contrary, was misapplied in FG and is reserved for the plants distributed along a continuous area from northeastern Spain and southern France to Italy. Similar-looking (native) plants that occur much further north in France (including in parts of the Flora area) belong to *V. teucrium*, more precisely to a western race that was treated as var. *angustifolia* Vahl by Rojas-Andrés & Martínez-Ortega l.c., var. *teucrium* having a more eastern distribution (mostly in Germany, Austria and Bulgaria). These are two mostly allopatric octoploid entities that are morphologically distinct and therefore best treated as two distinct species, *V. angustifolia* (Vahl) Bernh. and *V. teucrium* s.str. respectively (Padilla-García *et al.* l.c.). Plants that naturally occur in the southern part of the Flora area belong to the former. Natural populations from Fluv. in the Netherlands apparently belong to *V. teucrium* s.str. To further add to the confusion, more or less intermediate plants between the latter and *V. prostrata* (s.str.?) have been recorded in the Netherlands (H24).

In addition, the identity of adventive or escaped plants from this complex also requires a critical reassessment.

- *V. spicata* L.: this species was introduced on some slag heaps in Camp., as part of wild flower seed mixtures, and subsequently managed more or less to naturalize. These plants differ from the native populations in the Flora territory, notably by their generally paler corollas with linear and twisted lower lobes. They appear to belong, at least in part, to subsp. *orchidea* (Crantz) Hayek.
- *Linaria simplex* (Willd.) DC.: this southern species was already known from some areas in northern France. Its naturalization there was recently confirmed and the species further spread to Belgium where it also seems to naturalize locally. It was therefore added to the key and a full account was presented.
- The binomial *Digitalis* × *media* Roth for the hybrid *D. grandiflora* Mill. × *lutea* L. was removed. According to The Plantlist, this is a synonym of *D. lutea*. Perhaps there is no valid name for this hybrid (see also FG). TAXREF attributes this name to P. Fournier (1930). Possibly Fournier described this hybrid in 1930 but Roth already used the same name in 1800 for a species now considered as a synonym of *D. lutea*.

153. Scrophulariaceae

- An additional alien species has been recorded as an ephemeral escape from cultivation: *Alonsoa intermedia* Lodd. (Heverlee, 2017; wn.be). Another, more frequent escape, *Sutera cordata* (Thunb.) O. Kuntze, is now accommodated in the segregate genus *Chaenostoma* Benth.,

as *C. cordatum* (Thunb.) Benth., based on recent molecular studies (Kornhall & Bremer 2004, 2005).

- *Buddleja davidii* Franch.: a hybrid with *B. globosa* Hope, *B. ×weyeriana* Weyer, is sometimes cultivated as an ornamental in gardens and has recently been found in the wild (dunes, slag heaps). However, it is not clear whether such plants are genuine escapes or mere relics of former cultivation. This hybrid has globular inflorescences with yellowish corollas.

- An additional hybrid *Verbascum* L. has been recorded since 2014, *V. ×angulosum* Teyber (*V. nigrum* L. × *speciosum* Schrad.) (e.g. in Lommel in Camp., with both parent species; wn.be).

- An additional (ephemeral) alien species of *Scrophularia* L. was recorded since 2020, *S. peregrina* L. (Turnhout, Oostende; wn.be). In 2016-2017 it was also observed in Vlissingen in Zeeland (wn.nl, H24).

- *S. umbrosa* Dum.: some recent Floras (e.g. FG) used the name *S. oblongifolia* Loisel. for this species. Both names were officially published in 1827 but Dumortier's *Florula Belgica* was probably only effectively published later (cf.: <https://www.biodiversitylibrary.org/page/33120830#page/747/mode/1up>). Loiseleur's name may thus indeed be older but there is no hard evidence. For sake of completeness, *S. oblongifolia* was added as a synonym (see also E+M Plantbase). This name is also poorly known, for example it does not appear in Tropicos.org, nor was it accepted in Buttler's *Florenliste*.

Two subspecies [subsp. *umbrosa* and subsp. *neesii* (Wirtg.) E. Mayer] are distinguished in the Flora area, the taxonomic value of which is not uncontested. According to some authors, these are two very different species with sympatric distributions, so the rank of subspecies has not been considered appropriate (Hand 2019, Gregor *et al.* 2020). Morphologically, the distinction between these two taxa apparently is not more complicated than that between *S. auriculata* L. and *S. umbrosa* s.l. The problem as well as the distribution of these two entities in the territory of the Flora must be studied again.

- *S. canina* L.: this is a fairly variable species. Naturalized populations from the Flora area probably all belong to subsp. *canina*. Plants recently found as a waif in the port of Ghent (Fl.), with corollas with a wide white border, belong to subsp. *bicolor* (Sm.) Greuter (syn.: *S. bicolor* Sm.).

154. Linderniaceae

- *Lindernia palustris* Hartmann: a rejection proposal for this long-neglected binomial (Rico *et al.* 2006) was accepted by the latest Congress (Shenzhen Code Appendices). Its correct name now becomes *L. procumbens* (Krocker) Borbás.

- In addition to the characters already used in the key to distinguish between *L. procumbens* and *L. dubia* (L.) Pennell, a few others that are deemed useful were added: corolla length (respect. 2.5-4 and 7-9 mm) and color (respect. pale pink and pink-lilac).

156. Pedaliaceae

- The correct name for the casual alien *Sesamum orientale* L. is *S. indicum* L.

157. Acanthaceae

- Various species of the genus *Acanthus* L. are cultivated for ornamental purposes in parks and gardens. The most common is probably *A. mollis* L.; it is regularly seen as an escape as already stated in NF6. Another species, *A. spinosus* L. with spiny leaf lobes, has very rarely been observed spontaneously (wn.be).
- *Thunbergia alata* Bojer ex Sims (Suzanne-aux-yeux-noirs. Suzanne-met-de-mooie-ogen) is also cultivated as an ornamental. It is a climbing plant with yellow or orange flowers with a black throat. This species has also been observed very rarely as an escape (wn.be).

158. Bignoniaceae

- In addition to the species of *Catalpa* Scop. already mentioned in NF6, a further species has been observed as an escape, *C. ovata* G. Don (wn.be), with leaves usually 3-5 lobed and a yellowish corolla about 25 mm in diameter.

159. Lentibulariaceae

- All species of *Utricularia* L. have become very rare in the territory of the Flora and most of them are even threatened with extinction. On the other hand, species of this genus are sometimes intentionally introduced into waterbodies, thus disrupting the natural distribution of certain species. The introduction of similar non-native species cannot be ruled out either. It has been demonstrated that *U. brennensis* Gatignol et Zunino, recently described from France (Gatignol & Zunino 2019), in fact represents an exotic (Asian) species, *U. tenuicaulis* Miki (Bobrov et al. 2022).

160. Verbenaceae

- Two additional species from Verbenaceae, others than *Verbena* L., have been recorded as escapes from cultivation: *Lantana camara* L. and *Phyla nodiflora* (L.) Greene. The latter species has been known since at least 2011 from a locality in Essen where it looks more or less established (wn.be).
- *Verbena bonariensis* L., a widely grown ornamental, is increasingly found as an escape and locally tends to naturalize, especially in urban habitats. It is now treated in detail in NF7.
- Two additional species of *Verbena* have been recorded as alien/escape: *V. bracteata* Lag. et Rodr. and *V. incompta* Michael (wn.be).

161. Lamiaceae

- General: *Clinopodium* L. now includes *Acinos* Mill. and *Calamintha* Mill. whereas *Betonica* L. was segregated from *Stachys* L., following recent insights based on molecular phylogenetic studies.

- Several additional species of Lamiaceae, pertaining to genera not treated in detail, have been recorded as aliens (marked with *) or escapes from cultivation: *Callicarpa bodinieri* H. Lév., *Caryopteris ×clandonensis* N.W. Simmonds ex Rehder, *C. incana* (Thunberg ex Houltuyn) Miquel, *Clerodendrum bungei* Steud., *C. trichotomum* Thunb., **Dracocephalum thymiflorum* L., *Lavandula stoechas* L., *Monarda didyma* L. and *Pycnanthemum pilosum* Nutt. (wn.be). Out of the casual escapes, a single species, *Lavandula angustifolia* Mill., locally tends to naturalize, e.g. in coastal dunes and urban habitats.

- *Mentha* L. The latest thorough revision for our territory dates back to Lebeau (1974, 1982) and the genus remains insufficiently known. Some modern treatments (e.g. FG) tend to accept species complexes rather than numerous (notho-) taxa. For instance, *M. spicata* L. is allegedly derived from *M. longifolia* (L.) Huds. and *M. suaveolens* Ehrh. (see, however, below). If so, it also includes all other hybrids derived from the same crossing, i.e. *M. ×villosa* Huds., *M. ×villosa-nervata* Opiz (not yet reported in previous editions of the NF but certainly present in our territory) and *M. ×rotundifolia* (L.) Huds. Recent molecular phylogenetic studies have shed new light on *Mentha* section *Mentha*. Heylen et al. (2021) demonstrated that, as a result of complex genomes, polyploidization and an extensive historical nomenclature, potentially cryptic taxa have gone unnoticed. A straightforward interpretation of phylogenetic relationships within the section *Mentha* is further hindered by dominant but outdated concepts on historically identified hybrid taxa. For instance, there is no evidence whatsoever that *M. spicata* is indeed of hybrid origin and *M. longifolia* was shown itself to be polyphyletic. In-depth additional studies are needed in order to better understand this section.

- *M. ×rotundifolia* (L.) Huds. certainly also occurs in the Flora area and appears to be not rare at all. It resembles *M. ×villosa* Huds. a lot but is (at least partly) fertile.
- Two additional species of *Mentha* are cultivated for ornament and were found as escapes or locally naturalized (wn.be): *M. cervina* L. (with a calyx with 4 teeth only and linear upper leaves) and *M. requienii* Benth. (with creeping threadlike stems and tiny leaves and flowers).
- *M. arvensis* L.: the three subspecies that were recognized in NF6 are doubtlessly of limited taxonomic value (see also FG).
- Several additional alien species of *Salvia* L. have been recorded: *S. hispanica* L. (Chia), *S. glutinosa* L. and *S. viridis* L. (wn.be).

- An additional species of *Origanum* L. has been recorded as an escape, *O. onites* L. (wall of river Dyle in Mechelen in 2020; wn.be).

- *Thymus praecox* Opiz: it is unclear which taxa/taxon from this complex occurs in the Flora area. Two were recognized up to the present: subsp. *praecox* and subsp. *ligusticus* (Briq.) Paiva et Salgueiro. According to FG, *T. praecox* s.str. is absent from France and only one species is found in the northernmost part of the country, *T. dru-*

cei Ronninger [syn.: *T. praecox* subsp. *ligusticus* (Briq.) Paiva & Salgueiro]. True *T. praecox* probably is a Central European species. The two subspecies currently accepted in NF are solely told apart based on stem indumentum: hairy throughout (subsp. *praecox*) or hairy on two opposite sides of the stem (subsp. *ligusticus*). However, holotrichous vs. allelotrichous stem hairiness is a virtually worthless character state and both types can be seen in *T. drucei*, sometimes within a same population (FG; comm. J.-M. Tison 01.2021).

- ***Clinopodium nepeta*** (L.) O. Kuntze now includes three subspecies: subsp. *nepeta* [with two varieties, var. *nepeta* and var. *glandulosum* (Req.) B. Bock], subsp. *sylvaticum* (Bromf.) Peruzzi et F. Conti and subsp. *ascendens* (Jord.) B. Bock. The two latter subspecies were treated as distinct species in NF6, resp. *Calamintha menthifolia* Host and *C. ascendens* Jord.

- Two taxa of ***Nepeta*** L., *N. racemosa* Lam. and *N. ×faassenii* Bergm. ex Stearn, are commonly grown as ornamentals these days and often escape (wn.be). Characters for their separation were added.

- ***Lamium galeobdolon*** (L.) L. was maintained as a member of *Lamium* L., not of a separate genus *Galeobdolon* Graec. ex Adanson or *Lamiastrum* Fabr. (contrary to e.g. H24). Molecular analyses demonstrated that it is not genetically distant enough from *Lamium* to be considered as a separate genus, and integration of *Galeobdolon* and *Lamium* is legitimate (Krawczyk *et al.* 2013).

- *L. ×holsaticum* E.H.L. Krause is indeed morphologically intermediate between *L. album* L. and *L. maculatum* L. However, molecular studies have shown that it is not a hybrid; it may either be a simple variation of *L. maculatum*, or a separate taxon (Bendiksby *et al.* 2011).

- An additional species of *Lamium* is grown for ornament and has been found as an escape: *L. orvala* L. (wn.be).

- *L. confertum* Fries: the hybrid nature of this species (*L. amplexicaule* L. × *purpureum* L.) was confirmed lately (Bendiksby *et al.* 2011).

- An additional species of ***Galeopsis*** L., *G. pubescens* Besser, is treated in detail. There were historical records for it from Belgium (Verloove 2006) and it was rediscovered in 2014 in two localities in Camp. (Postel and Ravels) where it was probably introduced and now naturalized. Subsequently it was also observed in a few other places in Camp. and is perhaps overlooked elsewhere (wn.be).

- ***Stachys recta*** L. var. *luxemburgensis* Lefort, mentioned from French Lorr. in NF6, is left unmentioned in FG and doubtlessly of minor taxonomic importance.

- ***Leonurus cardiaca*** L.: according to molecular studies (Marciniuk *et al.* 2014), subsp. *villosus* (Dum.-D'Urv.) Hyl. is a distinct, variable species (*L. quinquelobatus* Gilib.) that also includes forms that are more or less intermediate between *L. cardiaca* and *L. quinquelobatus*. The latter not only occurs as an adventive, it is also planted (as a bee plant?) and often escapes from cultivation (wn.be).

- An additional alien species of *Leonurus*, *L. marrubias-trum* L., has been recorded twice since 2017 along river Maas in the Netherlands in Fluv. (Maastricht, Meers) (wn.nl). In 2011, it was already recorded, probably as a mere casual, in Anderlecht (Brab.) by L. Delvosalle (Saintenoy-Simon 2012).

- ***Prunella grandiflora*** (L.) Schöller subsp. *pyrenaica* (Gren. et Godr.) A. et O. Bolòs, known from Sangatte in northwestern France, is now treated as a distinct species, *P. hastifolia* Brot. (see also FG).

- ***Ajuga ×hampeana*** A. Braun et Vatke: a proposal to conserve this name was rejected (Barrie 2011).

- *A. reptans* L.: a cultivar name for a widely planted and escaped form (“Atropurpurea”) was added.

- Two ornamental species of ***Teucrium*** L. have been recorded as escapes: *T. hircanicum* L. and *T. ×lucidris* Boom (*T. chamaedrys* L. × *lucidum* L.) (wn.be).

- *T. chamaedrys* L.: based on photos from wn.be, the extent to which the blades are hairy and incised seems to vary greatly. It is therefore doubtful that two subspecies can be distinguished in our territory (see also FG). Similarly, FT ascribes records from the Trier area to subsp. *chamaedrys*, whereas according to NF6 these plants belong to subsp. *germanicum* (F. Hermann) Rech. f. However, the latter is merely considered to be conspecific with subsp. *chamaedrys* in that area, like in France (comm. R. Hand, 03.2021).

- *T. scordium* L.: the taxonomic value of the two subspecies currently mentioned needs to be confirmed (see also FG). Plants found in the sole extant Belgian population seem to correspond to subsp. *scordium*.

162. Phrymaceae

- A species of the genus ***Mimulus*** L. (s.str.), *M. ringens* L., native to North America, is cultivated for ornamental purposes. This entirely hairless species with a bluish to purple corolla has been very rarely observed as an escape from cultivation (Fl., Fluv., Mosan; wn.be, wn.nl, H24, Dhaussy 2013).

- The generic circumscription of *Mimulus* L. has changed as a result of molecular phylogenetic studies (Beardsley & Olmstead 2002, Barker *et al.* 2012). With the exception of the single species mentioned above, all representatives previously recorded in the Flora area are now accommodated in the segregate genus ***Erythranthe*** Spach: the naturalized species *E. guttata* (Fisch. ex DC.) G.L. Nesom and *E. moschata* (Douglas ex Lindl.) G.L. Nesom and the casual escapes *E. lutea* (L.) G.L. Nesom var. *rivularis* (Lindl.) Silverside, *E. ×robertsii* (Silverside) G.L. Nesom and *E. cuprea* (Dombrain) G.L. Nesom. The latter is possibly more or less established in a single locality in Haute Ard. (surroundings of Waimes; wn.be).

163. Paulowniaceae

- The genus ***Paulownia*** Siebold et Zucc. and its species *P. tomentosa* (Thunb.) Steud. were already briefly men-

tioned, under Scrophulariaceae, in NF6. This species is increasingly escaping and in the process of local naturalization (wn.be). It was thus added to the keys, nowadays as a member of a family of its own, Paulowniaceae (Olmstead *et al.* 2001, Oxelman *et al.* 2005), and a species account was added.

164. Orobanchaceae

- The casual alien *Bellardia trixago* (L.) All. is now treated as *Bartsia trixago* L., following Molau's monographic study (Molau 1990). Recent molecular phylogenetic studies are inconclusive and pending additional studies a conservative approach was adopted.

- The generic limits of *Orobanche* L. have changed as a result of recent molecular phylogenetic studies. Species with three bracts (one median and two lateral) subtending each flower (vs. a single bract) and a tubular calyx with 4-5 lobes (vs. calyx divided into two lobes) are now accommodated in the segregate genus *Phelipanche* Pomel (Park *et al.* 2007). In the Flora area, this applies to *P. ramosa* (L.) Pomel, *P. purpurea* (Jacq.) Soják and *P. arenaria* (Borkh.) Pomel. All these species have entirely bluish corollas.

- *Orobanche reticulata* Wallr.: plants found in the Flora area have been ascribed to subsp. *pallidiflora* (Wimm. et Grab.) Hayek (Londo & Mourik 2001). Contemporary western European Floras do not seem to accept infraspecific taxa (e.g. FG, H24), although some authors (e.g. Kreutz 1995) treated it as a species of its own.

- *O. alsatica* Kirschl.: data on the host plants of this species in Lorr. are uncertain and in part contradictory. It has been observed on *Cervaria rivini* Gaertn., which indeed is typical of subsp. *alsatica*. The subsp. *libanotidis* (Rupr.) Tzvelev (a distinct species according to some authors, including FG: *O. bartlingii* Griseb.), on the other hand, parasites on *Libanotis pyrenaica* (L.) Bourgeau ex Nyman and *Seseli montanum* L. It differs from subsp. *alsatica* in particular by smaller flowers [corolla 12-17 mm long, against (15-)20-25 mm], filaments inserted 1.5-3.5 mm above the base of the corolla [in subsp. *alsatica*, filaments are inserted at (2-)4-7 mm above the corolla base] and a more slender habit. Although these two subspecies have been reported from Lorraine, the presence of subsp. *libanotidis* remains to be confirmed (Brulé 2009; comm. H. Brulé 05.2020). According to some authors (e.g. Kreutz 1995, Brulé l.c.), the latter is a taxon from Central Europe that is absent in France. The problem needs to be re-studied.

- An additional species of *Melampyrum* L. was recently recorded as an ephemera alien, introduced with timber, *M. nemorosum* L. (Ghent port area, 2015; wn.be).

- *M. sylvaticum* L. was reported on several occasions from Lorr. in France (FLORAINE 2013, Vernier 2020, SI-Flore), for instance from Plateau de Haye near Nancy (comm. S. Antoine 05.2021) and thus from the area covered by NF. However, *M. sylvaticum* typically grows in

fir and spruce forests on acidic substrates and normally does not occur below 1000 m. Claims of it from north-eastern France doubtlessly refer to a form of *M. pratense* L. with golden yellow corollas (corresponding to subsp. *pratense* of German authors) which is frequent in that part of France and which one often takes for *M. sylvaticum* (comm. J.-M. Tison, 08.2021).

- *M. pratense* L.: two subspecies are distinguished in NF [subsp. *pratense* and subsp. *commutatum* (Tausch ex A. Kern.) C.E. Britton] but these are not always easily told apart. According to FG, they are solely separated on flower color (respectively yellow and discolourous), a character that was added to the identification key.

- *Euphrasia* L.: FLORAINE (2013) lists *E. picta* Wimm. for the Flora area, just south of Toul. According to Vernier (2020) and FG, this species occurs in Lorr. only in Hautes-Vosges, thus outside the Flora area (also comm. S. Antoine, 05.2021).

As was already stated in NF6, this genus remains very complex in terms of taxonomy and requires additional studies, in particular as regards the taxa present in the southern part of the territory. It should be noted that the treatment in NF roughly agrees with that of FG and thus still is in line with current-day concepts.

- *E. officinalis* L.: three subspecies are distinguished in the territory of the Flora, the taxonomic value of which is disputed by some authors [not only that of subsp. *camp-estris* (Jord.) Kerguelen et Lambinon as stated in NF6]. Only the nominal subspecies is quite distinct but of arctic origin (FG) and thus absent from the Flora area.

- *Odontites jaubertianus* (Boreau) D. Dietrich ex Walp.: this is in fact a stabilized hybridogenic tetraploid species of *O. luteus* (L.) Clairv. × *vernus* (Bellardi) Dum. subsp. *serotinus* Corb. parentage. However, occasional hybrids can also result from a recent hybridization between these taxa; such plants are named *O. ×senneni* Rouy.

- An additional alien species of *Parentucellia* Viv. has recently been detected in some campsites: *P. latifolia* (L.) Caruel (Verloove *et al.* 2020a). It was already known from the southern border of the Somme estuary, just outside the Flora area (Digitale2).

165. Aquifoliaceae

- *Ilex* L.: two hybrids of horticultural origin (sometimes hardly distinguished from *I. aquifolium* L.) are frequently grown as ornamentals and both are increasingly escaping from cultivation (wn.be). *I. ×altaclerensis* (Loudon) Dallim. (*I. aquifolium* × *perado* Ait.) was already mentioned in NF6 but it should be noted that its leaf margins can also be entire (e.g. in 'Cameliifolia' or 'Belgica'). *I. ×meserveae* S.Y. Hu (*I. aquifolium* × *rugosa* F. Schmidt) is similar-looking but it is smaller in stature (1-2 m) and leaves are only 2-6 cm long.

- An additional species of *Ilex* L. is treated in detail, *I. crenata* Thunb. In few years' time it has become more or less widely naturalized in Camp. and has also been re-

corded elsewhere (wn.be, H24). With its small, evergreen leaves, rapid growth and disease resistance, *I. crenata* is increasingly replacing boxwood balls in gardens.

166. Campanulaceae

- Several additional alien taxa were recorded recently, all as (casual) escapes from cultivation: *Isotoma axillaris* Lindl., *Platycodon grandiflorus* (Jacq.) DC. (both recorded in urban habitats, respectively since 2018 and 2013) and *Triodanis perfoliata* (L.) Nieuwl. (Boom, 2018) (wn.be).
- *Wahlenbergia hederacea* (L.) Reichenb.: genetically, this species is distant from the rest of the members of *Wahlenbergia* Schrad. ex Roth. It has been suggested to place it in a monospecific genus, as *Hesperocodon hederaceus* (L.) Eddie et Cupido (Eddie & Cupido 2014).
- *Campanula poscharskyana* Degen: this ornamental is now fully naturalized and thus keyed-out and a full account provided.
- *Pratia pedunculata* (R. Brown) Benth. is now treated as *Lobelia pedunculata* R. Brown (see e.g. Lammers 2011).

168. Asteraceae

- Rather numerous ephemeral aliens from the Asteraceae family have been recorded lately. The following, all from genera not treated in detail, were observed as escapes from cultivation (data, unless otherwise stated, from wn.be): *Acmella oleracea* (L.) R.K. Jansen, *Amberboa moschata* (L.) DC. (syn.: *Centaurea moschata* L.), *Argyranthemum frutescens* (L.) Schultz-Bip., *Cynara cardunculus* L., *C. scolymus* L., *Dimorphotheca pluvialis* (L.) Moench, *Heteranthemis viscidhirta* Schott [syn.: *Chrysanthemum viscidhirtum* (Schott) Thell.; herbarium L. Delvosalle, BR], *Leptinella dispersa* (D.G. Lloyd) D.G. Lloyd et C.J. Webb (syn.: *Cotula dispersa* D.G. Lloyd), *Liatrix spicata* (L.) Willd., *Ligularis przewalskii* (Maxim.) Diels, *Psephellus dealbatus* (Willd.) K. Koch (syn.: *Centaurea dealbata* Willd.), *Tithonia rotundifolia* (Mill.) S.F. Blake and *Vernonia fasciculata* Michx.

Some escapes that were already mentioned in NF6 are now accommodated in other genera, as a result of recent molecular phylogenetic studies: *Ageratina altissima* (L.) King et Robinson (syn.: *Eupatorium rugosum* Houtt.), *Dendranthema ×grandiflorum* (Ramat.) Tzvelev (syn.: *Chrysanthemum ×grandiflorum* Ramat.), *Eurybia divaricata* (L.) Nesom (syn.: *Aster divaricatus* L.) (perhaps locally naturalizing), *Euthamia graminifolia* (L.) Nutt. [syn.: *Solidago graminifolia* (L.) Salisb.] [probably very locally naturalizing in Lorr. mér., in Rosières-aux-Salines (Pax 2019) and near Breda (Camp.) and Meerssen (Brab. or.) in the Netherlands (H24, wn.nl). It should be noted, however, that the identity of these plants possibly needs to be reassessed: plants found naturalized in Europe at least partly belong to *E. lanceolata* (L.) Nesom; obs. author, Nesom 2021a and b], *Eutrochium maculatum* (L.) E.E. Lamont (syn.: *E. maculatum* L.) (known by now from several localities and locally perhaps naturalizing) and *E. purpureum* (L.) E.E. Lamont (syn.: *E. purpureum* L.) and

Mauranthemum paludosum (Poiret) Vogt et Oberprieler [syn.: *Leucanthemum paludosum* (Poiret) Bonnet et Baratte].

- Analogously, several ephemeral, genuine aliens (unintentionally introduced) from the Asteraceae family have been recorded lately, all from genera not treated in detail (data, unless otherwise stated, from wn.be): *Arctotheca calendula* (L.) Levyns (formerly a wool alien; since 2012 regularly recorded in port areas of Antwerp and Ghent), *Andryala integrifolia* L. (Herseaux, since 2019), *Gutenbergia rueppellii* Schultz-Bip. (port of Roeselare, 2013), *Notobasis syriaca* (L.) Cass. (port of Antwerp, 2014) and *Oncosiphon piluliferum* (L.f.) Källersjö (ports of Antwerp and Ghent, since 2017). One of these species, *Andryala integrifolia*, is a rather frequent native species just outside the Flora area (departments Aube, Seine-et-Marne; database CBN Paris). It is definitely spreading further north recently (Digitale2) and a natural range expansion towards and into the Flora area is quite likely.

Some aliens that were already mentioned in NF6 are now accommodated in other genera, as a result of recent molecular phylogenetic studies: *Cladanthus mixtus* (L.) Chevall. (syn.: *Anthemis mixta* L.), *Gamochaeta pensylvanica* (Willd.) Cabrera (syn.: *Gnaphalium pensylvanicum* Willd.) (locally perhaps naturalizing in urban habitats) and *Rhaponticum repens* (L.) Hidalgo [syn.: *Acropilton repens* (L.) DC.].

- *Inula crithmoides* L. is now accommodated in a separate genus, as *Limbarda crithmoides* (L.) Dum. (Gutiérrez-Larruscain *et al.* 2018).

- *Solidago altissima* L.: this species closely resembles *S. canadensis* L. and has been regularly reported in the Flora area, although until recently, always in error. It is a more robust hexaploid species (stem up to 200 cm high), stem hairy to the base, later flowering (late October-early November), with thick, more or less leathery leaves with almost entire or irregularly serrate margins and a 3-4 mm long involucre. It was recently found in the port of Antwerp (Verloove *et al.* 2017b) and could be overlooked elsewhere.

- The generic limits of *Aster* L. have dramatically changed in recent times, resulting from molecular phylogenetic studies (see Nesom 1994 for an overview). All but two of the Belgian representatives of the genus *Aster* s.l., native as well as non-native, are now accommodated in several other genera. An alphabetical overview is given in table 2 with respectively names applied in NF6 and currently accepted names

- *Tripolium pannonicum* (Jacq.) Dobroc.: occasionally, plants are observed with discoid flowers. These were referred to *Aster tripolium* var. *flosculosus* (S.F. Gray) P.D. Sell in NF6. A combination at varietal rank under *T. pannonicum* seems to be non-existing; however, if taxonomic recognition is appropriate, then at most at forma level, for which rank a name is available, f. *discoideum* (Reichenb. f.) B. Bock.

Table 2. Accommodation of the species of genus 'Aster' in NF7 as compared with NF6. Asterisk (*) indicates taxa not mentioned in NF6.

Name in NF6	Name in NF7
* <i>Aster ageratoides</i> Turcz.	<i>Aster ageratoides</i> Turcz.
<i>Aster amellus</i> L.	<i>Aster amellus</i> L.
<i>Aster brachyactis</i> S.T. Blake	<i>Symphotrichum ciliatum</i> (Ledeb.) Nesom
<i>Aster divaricatus</i> L.	<i>Eurybia divaricata</i> (L.) Nesom
<i>Aster dumosus</i> L.	<i>Symphotrichum dumosum</i> (L.) Nesom
<i>Aster ericoides</i> L.	<i>Symphotrichum ericoides</i> (L.) Nesom
<i>Aster lanceolatus</i> Willd.	<i>Symphotrichum lanceolatum</i> (Willd.) Nesom
<i>Aster lateriflorus</i> (L.) Britton	<i>Symphotrichum lateriflorum</i> (L.) Á. et D. Löve
<i>Aster linosyris</i> (L.) Bernh.	<i>Galatella linosyris</i> (L.) Reichenb. f.
<i>Aster novae-angliae</i> L.	<i>Symphotrichum novae-angliae</i> (L.) Nesom
<i>Aster novi-belgii</i> L.	<i>Symphotrichum novi-belgii</i> (L.) Nesom
<i>Aster pilosus</i> Willd.	<i>Symphotrichum pilosum</i> (Willd.) Nesom
* <i>Aster racemosus</i> S. Elliott	<i>Symphotrichum racemosum</i> (S. Elliott) Nesom
* <i>Aster subulatus</i> Michaux s.l.	<i>Symphotrichum subulatum</i> (Michaux) Nesom s.l.
<i>Aster ×salignus</i> Willd.	<i>Symphotrichum ×salignum</i> (Willd.) Nesom
<i>Aster tradescantii</i> L.	<i>Symphotrichum tradescantii</i> (L.) Nesom
<i>Aster tripolium</i> L.	<i>Tripolium pannonicum</i> (Jacq.) Dobrocz.
<i>Aster ×versicolor</i> Willd. (incl. <i>A. laevis</i> L.)	<i>Symphotrichum ×versicolor</i> (Willd.) Nesom [incl. <i>S. laeve</i> (L.) Á. et D. Löve]

- An additional species of *Aster* L. (s.str.) is much applied in public green these days: *A. ageratoides* Turcz. It is occasionally observed as an escape from cultivation since 2014 (wn.be).
- An additional species of *Symphotrichum* Nees, *S. subulatum* (Michx.) Nesom var. *squamatum* (Spreng.) S.D. Sundb. [syn.: *Aster squamatus* (Spreng.) Hieron.], was found as a casual alien in Kortrijk (Heule) in 2017 (wn.be). This is also a rather characteristic weed in plant containers in garden centers and plant nurseries.
- *S. lanceolatum* (Willd.) Nesom: this species is very variable as to the size of the flower heads, the color of the ligulate flowers, etc. In the past, some authors, notably in the Netherlands, considered that it is possible to distinguish two species, one of which corresponds to the North American species *S. tradescantii* (L.) Nesom. However, more recent cytometric studies have shown that in fact another North American species, *S. ontarionis* (Wiegand) Nesom (syn.: *Aster ontarionis* Wiegand), is involved (Dirkse *et al.* 2014). This species has not been found recently in the territory of the Flora but it could be present in Fluv.
- *Conyza* Less. was long included in *Erigeron* L. but Cronquist (1947) defended its separation from the latter genus, a point of view that since then was followed, almost without exception. However, recent molecular phylogenetic research showed that *Conyza* is in fact polyphyletic and nested within *Erigeron* (Noyes 2000; see also Greuter 2003a).
- In NF6, *E. canadensis* L. and *E. bilbaoanus* (J. Rémy) Cabrera were primarily separated based on the number of florets per head, respectively 10-15 vs. 4-6. This, however, is not a reliable feature [also compare with Strother (2006) in *Flora of North America*, sub *Conyza canadensis* (L.) Cronq. and *C. floribunda* Kunth].

- *E. acris* L.: this is a very variable species that perhaps includes two subspecies in the territory of the Flora: the nominal subspecies has stem leaves that are twisted or not, with green basal leaves present at anthesis and is mainly flowering in summer; some plants have very twisted stem leaves, with basal ones withered at anthesis and is flowering in fall. Such plants have been assigned to subsp. *serotinus* (Weihe) Greuter (syn.: *E. serotinus* Weihe; *E. muralis* Lapeyr.) (Pliszko 2015 and references therein). The taxonomic value, distribution and status of the latter are to be specified in the Flora area. It is predominantly found in highly anthropized environments (slag heaps, railroads; e.g. Remacle 2014). However, plants with ± intermediate characters are observed in natural habitats as well, including coastal dunes where subsp. *acris* also occurs. The problem requires further study.
- A proposal to conserve the name *Filago vulgaris* Lam. against *Gnaphalium germanicum* L. [syn.: *Filago germanica* (L.) Huds.] (Andrés Sánchez *et al.* 2011) was not approved (Applequist 2012). Thus, the latter binomial is applied now for the species called *F. vulgaris* in NF6.
- Two species that were included in *Filago* L. in NF6 [*F. gallica* L. and *F. minima* (Smith) Pers.] are now accommodated in the segregate genus *Logfia* Cass., resulting from molecular phylogenetic studies (Galbany-Casals *et al.* 2010), which is in accordance with other contemporary western European Floras (FG, H24, Stace 2019).
- The generic limits of *Gnaphalium* L. have changed but are still unclear. The taxonomy of FG was followed (except for *Gamochoaeta* Wedd.) which implies that *G. luteoalbum* L. was transferred to the segregate genus *Laphangium* (Hilliard et B.L. Burt) Tzvelev. Other recent flora accounts either applied a conservative approach (H24) or further dismantled *Gnaphalium* (Stace 2019).

- The generic limits of *Inula* L. are very unclear. Recent molecular phylogenetic studies (e.g. Gutiérrez-Larruscain *et al.* 2018) found that generic delimitations within the *Inula* complex need to be revised. *Inula* could either be accepted in a broader sense (incl. *Telekia* Baumg. and other segregates) or most species (incl. the type!) be segregated as *Pentanema* Cass. Pending additional studies, a more conservative approach was followed (see also H24, Stace 2019).
- *I. racemosa* Hook. f.: this Asian ornamental has been known since 2001 in Belgium. Currently, it is much more frequently cultivated as an ornamental than *I. helenium* L. and is increasingly observed as an escape as well, also in northwestern France (Verloove 2008a, Lemoine 2015a). It is now naturalized locally and thus was added to the key and a full account is presented. Although the distinction between these two species is usually straightforward, plants with more or less intermediate characters are sometimes observed.
- The casual alien *Pulicaria paludosa* Link is now called *P. arabica* (L.) Cass. subsp. *hispanica* (Boiss.) Murb.
- *Xanthium orientale* L.: in NF6, this species was accepted in a broad sense. It is a very complex group, made up of taxa probably of American origin but which gave rise, after their introduction in Europe, to populations which were partly different from the original strains. The plants that are naturalized in Fluv. roughly correspond with the microspecies *X. saccharatum* Wallr. However, recent molecular studies have shown that this and all other microspecies should be included in a single, highly variable species, *X. orientale* (Tomasello 2018).
- The exact taxonomic placement of *Iva xanthiifolia* Nutt. remains unresolved. Some recent authors (incl. Stace 2019) accommodated it in *Euphrosyne* DC. Pending further studies, a conservative approach was adopted but its name in the latter genus [*Euphrosyne xanthiifolia* (Nutt.) A. Gray] was added, as a synonym.
- An additional (ephemeral) species of the genus *Guizotia* Cass. has been recorded lately, *G. scabra* (Vis.) Chiov. subsp. *schimperi* (Schultz-Bip.) J. Baagøe (syn.: *G. schimperi* Schultz-Bip.) (Lokeren, 2015; wn.be).
- *Coreopsis* L. is, according to some molecular phylogenetic studies, better included in *Bidens* L. The corresponding name for *C. lanceolata* L. in the latter genus, *B. lanceolata* (L.) Banfi, Galasso et Bartolucci, was added as a synonym (Banfi *et al.* 2018).
- An additional species of *Helianthus* L., *H. maximiliani* Schrad., is grown as an ornamental and has been recorded as an escape from cultivation (Roeselare, since 2019; wn.be). *H. decapetalus* L., already mentioned in NF6 as an ornamental species, also occurs as a very rare escape (since 2011; wn.be).
- There is general agreement now that *H. laetiflorus* Pers., considered as a species in NF6, is in fact a hybrid of *H. rigidus* (Cass.) Desf. × *tuberosus* L. parentage.
- *Cosmos* Cav. is, according to some molecular phylogenetic studies, better included in *Bidens* L. The corresponding name for *C. bipinnatus* Cav. in the latter genus, *Bidens formosa* Schultz-Bip., was added as a synonym.
- *Bidens connata* Muhlenb. ex Willd.: this species is frequently confused with individuals with entire (undivided) leaves of *B. tripartita* L. Based on achene characteristics both species can usually be distinguished, although they are obviously very close, perhaps even conspecific (Strother & Weedon 2006).
- The generic limits of *Anthemis* L. have dramatically changed as a result of recent molecular phylogenetic studies (e.g. Oberprieler 2001, Lo Presti *et al.* 2010). As currently understood, in the Flora area, the genus includes only two native species, *A. arvensis* L. and *A. cotula* L., and the casual alien *A. ruthenica* Bieb. The others were transferred to segregate genera like *Chamaemelum* Mill. (*A. nobilis* L.), *Cladanthus* Cass. (*A. mixta* L.) and *Cota* J. Gay. (*A. altissima* L., *A. austriaca* Jacq. and *A. tinctoria* L.).
- Similarly, the generic limits of *Matricaria* L. have also changed. *M. maritima* L. now belongs in *Tripleurospermum* Schultz-Bip. (Oberprieler 2001).
- The correct name for the species called *Matricaria recutita* L. in NF6 is *M. chamomilla* L. (Applequist 2002, Hansen & Christensen 2009).
- Two subspecies of *Tripleurospermum maritimum* (L.) Koch are now accepted as two distinct species, *T. maritimum* s.str. and *T. inodorum* (L.) Schultz-Bip., which is in accordance with most contemporary western European Floras (FG, Stace 2019). Both, however, are interfertile and according to some authors merely expressions of a single variable species (see discussion in H24). Both form a moderately supported clade in molecular phylogenies but differ in genome size (Inceer *et al.* 2018). The issue requires further study.
- An alien species of *Tripleurospermum*, *T. decipiens* (Fisch. et C.A. Mey.) Bornm., has rarely been observed as a casual grain alien in the Antwerp port area since 2011 (wn.be).
- *Leucanthemum vulgare* Lam. of NF6 in fact includes two distinct species in the Flora area, *L. vulgare* s.str. (diploid) and *L. irtutianum* DC. [tetraploid, derived from *L. vulgare* and *L. virgatum* (Desr.) Clos] (e.g. Konowalik *et al.* 2015).
- *Cotula australis* (Spreng.) Hook. f.: this South African weed, formerly known as an ephemeral wool alien in the Flora area, has recently naturalized, on the one hand in urban areas, on the other hand in campsites (Verloove *et al.* 2020a). It was added to the key and a full account is presented.
- *Soliva sessilis* Ruiz et Pav.: like the preceding species, this South American species has been known for a long time as a casual wool alien in the Flora area. It has recently naturalized in campsites (Verloove *et al.* 2020a)

and was therefore added to the key and a full account presented. Its fruit has a persistent and spiny style when ripe and attaches very easily to clothing which enhances its dispersal.

- An additional alien species of *Artemisia* L. has been recorded as an escape from cultivation, *A. ludoviciana* Nutt. (scattered observations since 2015; wn.be).

- The Far Eastern weed *A. princeps* Pamp. probably has been overlooked for some time in the Flora area, as a result of confusion with *A. verlotiorum* Lamotte (Verloove & Andeweg 2020, Verloove *et al.* 2020b). It is more or less intermediate between *A. vulgaris* L. and *A. verlotiorum*, is locally naturalized or even quite invasive and thus added to the key and a full account presented.

- *A. maritima* L.: two varieties that were distinguished in NF6 [var. *maritima* and var. *pseudogallica* (Rouy) J. Duvigneaud et Lambinon] are doubtlessly of little taxonomic value (compare with FG) and thus removed.

- *Petasites japonicus* (Sieb. et Zucc.) Maxim.: this East Asian ornamental is now fully naturalized in the Flora area. It was added to the identification key and a full account was presented.

- The generic limits of the polyphyletic genus *Senecio* L. have considerably changed as a result of recent molecular phylogenetic studies (Pelser *et al.* 2002). *Jacobaea* Mill. is now segregated and its generic status is furthermore supported by hybridization behavior: there are several hybrids within *Jacobaea* while there are none between *Jacobaea* and *Senecio*. However, morphologically both genera are poorly separated. In *Jacobaea* the number of inner involucre bracts usually equals the number of ligules, whereas in *Senecio* s.str. the number of inner involucre bracts is ca. 1,5-2 times the number of ligules. Moreover, in *Jacobaea* the surface of the achenes is finely papillose while achenes are usually smooth in *Senecio* s.str. Representatives of the genus *Jacobaea* are mostly biennial or perennial. In the Flora area the following species were transferred to *Jacobaea*: *S. paludosus* L., *S. cineraria* DC., *S. erucifolius* L., *S. jacobaea* L. and *S. aquaticus* Hill (incl. *S. erraticus* Bertol.).

- *S. ovatus* (P. Gaertn., B. Mey. et Scherb.) Willd.: in NF6, two subspecies were said to be present in the territory of the Flora, subsp. *ovatus* and subsp. *alpestris* (Gaudin) Herborg, the latter being restricted to the western and southwestern part of the species' distribution range. Moreover, plants with intermediate characters were also said to be present. According to FG, however, the northernmost populations of subsp. *alpestris* are located in the Jura and in the Paris CBN database the most northerly records are in Yonne, i.e. well beyond the Flora limits. Therefore, it appeared very unlikely that true subsp. *alpestris* is present in the Flora area. Yet, the presence of the latter was recently confirmed in northwestern France (e.g. in Forêt d'Hardelot in Boul.) where subsp. *alpestris* indeed seems to be the 'usual' taxon (comm. B. Toussaint, 10.2021).

- Hybridization between species of the genus *Jacobaea* is regularly observed. The following hybrids have been observed in the Flora area: *J. ×albescens* (Burb. et Colgan) Verloove et Lambinon ex Verloove et Galasso [*J. maritima* (L.) Pelser et Meijden × *vulgaris* P. Gaertn.] and *J. ×ostenfeldii* (Druce) B. Bock [*J. aquatica* (Hill) P. Gaertn., B. Mey. et Scherb. × *vulgaris*]. The former is usually produced wherever both parents occur in close proximity (for instance in cemeteries; see also Verloove & Lambinon 2011), whereas the latter was recorded in the Bourgoyen-Ossemeersen nature reserve in Ghent in 2017, together with the parent species (wn.be).

- *J. aquatica* (Hill) P. Gaertn., B. Mey. et Scherb.: in NF6, two subspecies were distinguished, the nominal subspecies and a subspecies that was called *S. aquaticus* Hill subsp. *erraticus* (Bertol.) Tourlet. A combination for the latter under *J. aquatica* was not yet available and was validated by Verloove & Galasso (2023), subsp. *erratica* (Bertol.) Verloove & Galasso. The taxonomic status of the latter remains uncertain. FG accepted it as a distinct species, *J. erratica* (Bertol.) Fourr., emphasizing however that according to Pelser *et al.* (2002) it probably merely is a variety of *J. aquatica*, a point of view followed by H24.

- *Doronicum orientale* Hoffm.: this ornamental was reported from three localities in Lorr. (FLORAINE 2013; see also Vernier 2020). However, according to FG statements of this kind are incorrect or require confirmation.

- *Carlina vulgaris* L. subsp. *longifolia* Nyman (syn.: *C. biebersteinii* Bernh. ex Hornem.): at one time, some populations of *C. vulgaris* from the eastern part of the Flora area were thought to be possibly referable to this taxon. In the latest edition of the NF, this assumption was considered to be rather unlikely. Indeed, no data indicate its presence in the Flora area, neither in France (Digitale2, database CBN Paris, AFL), nor in Germany (FT, FloraWeb). According to FG its northernmost occurrences are in the Vosges and the species is absent below 1200 m of altitude.

On slag heaps in Camp. or. (Belgium) some naturalized populations also show some resemblance to subsp. *longifolia* but within these populations plants with characters typical of subsp. *vulgaris* also occur (wn.be). Their exact identity remains uncertain.

- The couplet in the identification key that allows to distinguish *Carduus acanthoides* L. and *C. crispus* L. was thoroughly modified, based on Verloove (2014).

- The alien *C. vivariensis* Jord. is better treated as *C. nigrescens* Vill. subsp. *vivariensis* (Jord.) Bonnier et Layens (FG).

- *C. nutans* L.: several subspecies have been reported in the past in the territory of the Flora. At present, only subsp. *nutans* seems to be present (at least as a native or naturalized entity). It is characterized by flower heads 2-4 cm in diameter and involucre bracts 1.5-3 mm wide. The subsp. *leiophyllus* (Petrovič) Arènes (syn.: *C. thomeri* Weinm.) has 4-8 cm wide flower heads and 3-8 mm

wide involucre bracts and is rarely seen as an (usually) ephemeral adventive (except perhaps in parts of Mar., for instance in the Dunkerque area, where it may persist for some time; comm. B. Toussaint, October 2021). According to FG, the latter is possibly not distinct from subsp. *platylepis* (Reichenb. et Sault.) Nyman. The *C. carduus* complex anyhow requires further study.

- An ephemeral alien species of *Onopordum* L. was recently observed, *O. tauricum* Willd. (Linkhout, 2014; wn.be).

- *O. acanthium* L.: the native (or long-naturalized?) plants are markedly different from plants grown for ornament. The latter are characterized by densely woolly-araneous leaves and involucre and probably belong to *O. ×beckianum* (John) Sutory, the hybrid between *O. acanthium* and *O. illyricum* L. This hybrid is observed here and there as an escape (wn.be).

- The generic limits of *Centaurea* L. have long been controversial. As traditionally circumscribed it is a polyphyletic assemblage. Molecular phylogenetic studies have considerably redefined its limits and several segregate genera have now become widely accepted. A modern treatment is now followed in NF7 as well. Two genera were segregated: *Amberboa* (Pers.) Less. (Susanna *et al.* 1995) and *Cyanus* Mill. (Greuter 2003b, although some authors are reluctant to accept generic status for the latter, e.g. Boršić *et al.* 2011, Hilpold *et al.* 2014). *Cnicus* L., on the contrary, traditionally accepted as a genus of its own was shown to be nested in fact in *Centaurea* (Garcia-Jacas *et al.* 2000).

- Three alien species of *Centaurea* were recently newly recorded. The adventive *C. diffusa* L. has been observed since 2018 as grain alien in the Ghent port area. The same species was also recorded from a slag heap in Hénin-Beaumont in northwestern France (Lemoine 2018). In addition, two ornamentals have been observed as escapes from cultivation recently: *C. calocephala* Willd. (Laakdal, 2014; wn.be) and *C. macrocephala* Willd. (scattered occurrences since 2012; wn.be).

- The correct name for the hybrid *C. diffusa* L. × *stoebe* L. that was called *C. ×psammogena* Gayer (1909) in NF6 is, for reasons of priority, *C. ×varnensis* Velen. (1891).

- *C. stoebe* L.: the infraspecific variability of this species in Belgium requires further study. In wild flower seed mixtures, subsp. *micranthos* (Gugler) Hayek [syn.: subsp. *australis* (A. Kerner) Greuter] seems to be the usual taxon (Frank & John 2007). It is a potentially invasive (allo-)tetraploid eastern taxon, that was also introduced to North America. According to some authors this taxon and *C. stoebe* s.str. are two distinct species (Mráz *et al.* 2011), although the morphological distinction between the two seems rather weak. Flow cytometric analyses on five samples from the Waasland port area (where the species is fully naturalized and spreading) demonstrated that all are indeed tetraploids (pers. comm. P. Mráz & A. Pieters, 01.2022).

- *C. jacea* L. complex: this remains a difficult group, comprising populations differing in morphology, phenology, ecology and chromosome number, in which hybridization appears to be frequent; moreover, there is a lot of phenotypic plasticity in this complex. Some authors only admit a single species, completely ignoring certain infraspecific taxa, or even more or less well characterized species; others distinguish up to ten or more species that are linked by intermediates. In accordance with recent treatments in neighboring regions (notably in France, Germany and Great Britain; e.g. FG, Stace 2019), the group has been reworked, accepting in addition to *C. jacea* s.str. [with two subspecies, subsp. *jacea* and subsp. *timbalii* (Martini-Donos) Br.-Bl.] three more or less distinct species: *C. decipiens* Thuill. (accommodating the infraspecific taxa intermediate between *C. jacea* and *C. nigra* L.), *C. nigra* and *C. nigrescens* Willd. (the latter not being indigenous in the territory of the Flora). This system is still provisional; further (molecular) research on this complex remains essential. Vanderhoeven *et al.* (2002) already demonstrated that there is a lot of phenotypic plasticity and that, when cultivated *ex situ*, many character states change (e.g. heads radiate or not). In our area there may rather be only two native, genuine species: the relatively rare *C. nigra* (diploid and in Belgium mostly confined to the Ardennes massif) and the remaining, widespread tetraploid populations.

- *C. jacea* L.: wild flower seed mixtures often include plants of *C. jacea* with deeply divided leaves with narrow segments and widely diverging inflorescence branches. Their identity is unclear and requires further study. They may belong to subsp. *angustifolia* (DC.) Greml. [syn.: *C. pannonica* (Heuff.) Simonk.], a taxon from Central and Eastern Europe.

Such seed mixtures also include plants with characters intermediate between those of *C. jacea* and *C. nigra* (or even *C. decipiens*). The appendages of the phyllaries are tawny as in *C. jacea* but the margins are irregularly toothed or deeply jagged. These are hybrids spanning the morphological spectrum of the putative parents. The name *C. ×gerslaueri* Erdner (syn.: *C. ×moncktonii* Britton, *C. ×drucei* Britton) can be applied for such plants. It is unknown whether or not such hybrids naturally occur in the Flora area.

- *C. nigrescens* Willd.: this alien species is locally naturalized (or was previously overlooked?) in the Flora area. It was added to the key and a full account is presented. It presents a combination of characters that allows it to be identified fairly easily: leaves with a broad blade and narrowed at the base, the upper more or less amplexicaul; flower heads small (involucre up to 12 mm in diameter); appendages of the middle phyllaries consisting of a triangular central part and fringes equal to or slightly exceeding their width, leaving the underlying bracts more or less exposed; heads usually radiate; pappus nil or weakly developed (Hoste *et al.* 2015).

- *C. decipiens* Thuill.: as currently understood, this is a

very polymorphic and apparently hybridogenous species (*C. jacea* × *nigra*), which now accommodates several infraspecific taxa which were distinguished in NF6. The following names are now reduced to synonyms: *C. serotina* Boreau, *C. jacea* subsp. *debeauxii* (Godr. et Gren.) Douin, *C. debeauxii* Godr. et Gren., *C. nigra* subsp. *debeauxii* (Godr. et Gren.) Gugler, *C. jacea* subsp. *grandiflora* (Gaudin) Schübl. et Martens, *C. jacea* subsp. *pratensis* (Koch) Čelak., *C. debeauxii* Godr. et Gren. subsp. *thuillieri* Dostál, *C. thuillieri* (Dostál) J. Duvigneaud et Lambinon and *C. jacea* subsp. *microptilon* (Godr.) Douin. They were previously separated on the basis of particularly variable criteria: heads radiant or not, achenes with or without a more or less developed pappus (often variable in the same flower head), length and position (patent to reflected) of the appendages of the phyllaries,...

- An additional adventive species of *Cichorium* L. has been observed lately: *C. calvum* Schultz-Bip. (wn.be). It is occasionally included, as an impurity, in commercial birdseed mixtures.

- As a result of molecular phylogenetic studies the generic limits of *Leontodon* L. have changed. *L. autumnalis* L. was transferred to *Scorzoneroides* Moench (Samuel *et al.* 2006, Greuter *et al.* 2006).

- The infraspecific taxa recognized under *L. hispidus* L. are of uncertain taxonomic value. In addition to the nominal subspecies, subsp. *hyoseroides* (Welw. ex Reichenb.) Greml. is doubtlessly worth recognizing (see also FG) but the varieties recognized of these two subspecies (solely based on indumentum characters) are of debatable value. The Euro+Med plantbase, however, accepts *L. hyoseroides* Welw. ex Reichenb. as a distinct species and the varieties mentioned in NF6 as subspecies. Thus, for the time being, the infraspecific taxa of *L. hispidus* were upheld but their taxonomic value needs to be reassessed, preferably using modern techniques.

- The generic limits of *Picris* L. have changed as a result of molecular phylogenetic studies. *P. echioides* L. is now accommodated in the segregate genus *Helminthotheca* Zinn, characterized by conspicuously enlarged and cordate outer phyllaries of the capitula (Samuel *et al.* 2006).

- *Tragopogon* L.: in the Flora area plants are sometimes observed that are more or less intermediate between *T. pratensis* L. and *T. dubius* Scop. and these could correspond to their first generation hybrid (*T. ×crantzii* Dichtl). An allotetraploid resulting from repeated crosses between these two species is known as *T. miscellus* Ownbey in North America (Ownbey 1950, Novak *et al.* 1991, Soltis 2006). It is very similar to *T. pratensis* but larger and more robust and probably difficult to distinguish from the latter. Soltis *et al.* (2022), using ITS sequence data, recently showed that the morphologically diverse, broadly defined *T. dubius* in fact comprises a complex of at least ten different ITS types in its native range that ultimately merit recognition as separate species. This issue requires further study.

- *T. pratensis* L. subsp. *orientalis* (L.) Čelak.: according to recent molecular studies (Mavrodiev *et al.* 2012), this subspecies deserves a higher taxonomic rank. At least some of the plants observed in the territory of the Flora are obviously introduced, especially as a component of wild flower seed mixtures. It naturally predominantly occurs in eastern and northeastern Europe. Its correct name at species rank, *T. orientalis* L., was added.

- *Chondrilla juncea* L.: in two localities in the Flora area (Pic. mér. in France and Lorr. sept. in the Grand-Duchy of Luxembourg) plants are found with numerous stem leaves, the upper with lanceolate leaf blades. The leaf blades are hirsute-spinulose on the margins and on the back of the midrib and the basal leaf blade is pinnately lobed. These plants correspond to *C. latifolia* Bieb. [syn.: *C. juncea* L. var. *latifolia* (Bieb.) Boiss.] and have always been treated as such in NF although its taxonomic relevance was questioned. However, recent genetic studies now have shown that the latter is just part of the morphological variable apomictic *C. juncea* (Kashin *et al.* 2019).

- *Taraxacum* Wiggers: the account for *Taraxacum* was updated by Jean-Patrice Matysiak, based on data extracted from van Soest (1957, 1969), Øllgaard (1986), Oosterveld (1993), Kirschner *et al.* (1994), Hagendijk *et al.* (1998), Kirschner & Štěpánek (1998), Uhlemann (2003), Uhlemann *et al.* (2005), Ferrez in Tison & de Foucault (2014), Kirschner *et al.* (2019), online resources such as Taraxacum Nederland (<https://www.taraxacumnederland.nl/>) and TARDET (Hagendijk *et al.* 2007), the Øllgaard herbarium, as well as field and herbarium observations by the author (JPM).

- The correct name for sect. *Ruderalia* is sect. *Taraxacum* (Kirschner & Štěpánek 2011).

- *T.* section *Erythrosperma* (Lindb. f.) Dahlst.: based on data provided by the late Piet Oosterveld, who methodically traveled the Netherlands and neighboring regions, the account (incl. the identification key) for this section was completely reworked.

- *T. silesiacum* Dahlst. ex Hagl.: the vast majority of specialists now consider this species to be conspecific with *T. parnassicum* Dahlst.

- *T. wallonicum* v. Soest: the separation of this species from *T. lacistophylloides* Dahlst. is problematic: in some plants achenes have intermediate dimensions and the leaves of the two species are identical; we considered them to be conspecific, the latter name having nomenclatural priority. Van Soest described other Mediterranean taxa which also appear to be synonyms of *T. lacistophylloides*.

- *T. clemens* Matysiak: in NF6, this species was keyed out amidst species with light brown to cinnamon achenes; however, its achenes are rather reddish than brown.

- *T. proximum* (Dahlst.) Raunk., *T. proximiforme* v. Soest and *T. pseudoproximum* v. Soest: this is a very fuzzy species complex. Based on cultivation experiments by Piet Oosterveld, it turned out that *T. proxi-*

mum is exceedingly variable with respect to the presence or absence of pollen, leaf shape and achene color. It should either be further segregated into several additional taxa or accepted as a single, highly variable species. The latter concept was applied (note that Piet Oosterveld has not found *T. pseudoproximum* in the type locality or elsewhere; similar-looking taxa were found, but with red achenes).

- *T. polyschistum* Dahlst.: this species was included in NF6 as a result of a confusion with what now is called *T. clemens*. In fact, *T. polyschistum* is a Scandinavian species which does not reach the Flora area.
- *T. perincisum* (J. Murr) J. Murr: according to Štěpánek & Kirschner (2017) the lectotype of *T. perincisum* belongs to the taxon usually referred to as *T. oxoniense* Dahlst. The former, older name should therefore replace *T. oxoniense*.
- *T. argutum* Dahlst.: this species was recently recorded for the first time in the Flora area, in Mar. mér. (France; Matysiak 2017).
- *T. section Palustria* (Lindb. f.) Dahlst.: the identification key was completely reworked. Achene characters provide good support for identifications and relevant data for these were mostly extracted from Kirschner & Štěpánek (1998) and Uhlemann *et al.* (2005). Stigma color, on the contrary, was avoided as much as possible because the hues are often very close. Analogously, robustness turned out to be a variable and thus unreliable feature (e.g. the usually robust *T. udum* Jord. also occurs with small individuals in Wingles in northwestern France). All species are divided in two major groups: those with undivided leaves (merely dentate or very shallowly lobed) and those with divided leaves.

Taxa with undivided leaves:

- *T. pauckertianum* Hudziok: Kirschner & Štěpánek (1998) indicated the extensive variation in pollen presence / absence as being typical of this species (often variable in a single individual).
- *T. multilepis* Kirschner & Štěpánek: this species was originally (invalidly) described as a form of *T. balticiforme* Dahlst., f. *multilepis* v. Soest (nom. inval.) (Kirschner & Štěpánek 2014), based on specimens with undivided, dentate leaves. Kirschner & Štěpánek l.c. emphasized that leaves can be either undivided or, less often, lobed.
- *T. palustre* (Lyons) Symons: this species is often found with merely toothed leaves. Even then, it remains identifiable based on its bracts with a wide whitish margin.

These three previous taxa were grouped together in a first dichotomy (species with undivided leaves, i.e. dentate or very shallowly lobed).

Taxa with divided leaves:

- *T. delanghei* v. Soest and *T. aginnense* Hofstra were grouped in an entry that includes species with leaves like in sect. *Erythrosperma* or sect. *Taraxacum*, following Kirschner & Štěpánek (1998).

- *T. udum*: according to Kirschner & Štěpánek (1998) leaves in this species are very variable due to the extreme plasticity of the taxon, which led to the description of new species which ended up as synonyms. The author documented a population with a few hundred individuals in Wingles in northwestern France. These plants at first had quite undivided leaves and outer phyllaries of a beautiful bright red color, reminiscent of *T. duvigneaudii* v. Soest. The next year, however, the outer phyllaries were green, like in *T. delanghei*. Cultivation *ex situ* finally proved these plants to belong to a robust form of *T. udum* (Matysiak 2018). With its rather oval-lanceolate, erect or even spreading phyllaries, this species at first sight shows some resemblance with sect. *Celtica*.
- *T. section Celtica* A.J. Richards: the delimitation of this section is quite controversial. Piet Oosterveld applied a fairly strict concept, corresponding to that of Uhlemann *et al.* (2005). Meijer, in *Taraxacum Nederland*, created a new section (sect. *Frugalia*, nom. prov.) for *T. nordstedtii* Dahlst. and some others, and kept less characteristic taxa in the *Celtica* section. Uhlemann (2003) did exactly the opposite and accommodated *T. nordstedtii* and similar taxa in the *Celtica* section and the least characteristic taxa in a “*T. adamii*-Gruppe”. Kirschner *et al.* (2019) redefined the section. The relatively strict concept of NF6 was maintained.
 - *T. duvigneaudii* v. Soest: apparently no one has ever found this species after van Soest and its taxonomic identity remains unclear. From the description, with its red phyllaries, it may perhaps be conspecific with *T. udum* or *T. delanghei* (Matysiak 2010, FG).
 - *T. zevenbergenii* v. Soest: from cultivation experiments, it turned out that the description of the taxon was made late in the season, at the end of spring (Hagendijk *et al.* 1998). Only then the typical, rather broadly lobed leaves with the clear red petioles and midrib are formed. Therefore, the illustration was replaced with another, more typical leaf.
 - *T. johannis-jansenii* v. Soest is definitely synonymous with *T. hygrophilum* v. Soest.
 - The name *T. frugale* Hofstra was effectively published by Hofstra (2020) although this taxon had been recognized as early as 1997. It appears to consist of several clonal lineages. Populations from northern France (growing intermingled with *T. hygrophilum*) very subtly differ from Dutch populations and were tentatively named ‘*T. francofrugale*’ by Piet Oosterveld. Curiously, in the Netherlands, *T. frugale* exclusively occurs in the northern part of the country and then, further south, reappears in Mar., Brab. and Pic. in northwestern France (the species is apparently absent in the large area in between). Besides, *T. frugale* and *T. hygrophilum* are not exclusively acidiphilic taxa; they are also found on basic substrates, sometimes with species from sect. *Palustria*, but in slightly less humid conditions. They are often found together. *T. frugale* is

more resistant to shrubification (after abandonment of grazing) by producing very large leaves. In contrast, *T. hygrophilum* seems to survive the longest under eutrophication.

- *T. reichlingii* v. Soest: Piet Oosterveld has visited the type locality which is destroyed now (it has become a children's playground). Uhlemann reports it from eastern Germany, based on a herbarium specimen.
- *T. beeftinkii* Hagend., v. Soest et Zevenb.: this species is known from Voorland Nummer Een in Zeeuws-Vlaanderen (FZ). However, its taxonomic position is uncertain. We did not integrate it in sect. *Celtica* because it is not part of the 'hard' group, that is to say with the outer row of phyllaries erect and with sigmoidal lateral leaf lobes. It was also initially described and placed in the ex-section *Vulgaria* (Hagendijk *et al.* 1982). If it were integrated into the *Celtica* section, several others, currently classified in the *Taraxacum* section, should also be included. Meijer (Taraxacum Nederland) created a new section, *Frugalia* ined., which corresponds to the core *Celtica*. Uhlemann also splitted the group, placing the core species in the *Celtica* section, and the 'soft' (including *T. beeftinkii*, *T. gelertii* Raunk., *T. bracteatum* Dahlst., etc.) in an informal group., the *T. gelertii*-group. As long as the boundaries of section *Celtica* are not established, the ambiguity will continue.
- In section *Celtica*, Hagendijk *et al.* (1998) referred to the presence of mutants that are more successful under changing conditions. However, we believe there is also, at least to some degree, genetic exchange. For instance, in the Avesnois in northern France (Mosan occ.), there is some intergradation between *T. frugale* and *T. nordstedtii*.
- *T.* section *Taraxacum*: two additional species with reddish to purplish petioles and not producing pollen are known to occur in the Flora area: *T. exertiforme* Hagend. *et al.* and *T. morulum* Hagl. & v. Soest. Both were found in Carvin, in Brab. occ. (France), where they are very common in urban environments (and thus probably also occur elsewhere) (Matysiak 2012, Matysiak & Tison 2016). Finally, some species classically arranged in the section *Taraxacum* are sometimes separated from it and accommodated in section *Hamata* H. Øllgaard instead, some representatives at least of which are similar to the *Celtica* section. From this "Hamata section" two additional species have been recorded recently: *T. marklundii* Palmgr. and *T. pseudohamatum* Dahlst. (Matysiak 2012). Bonassi *et al.* (2017) reported *T. adamii* Claire from the Nancy area in Lorr. mér. (« à la base d'escarpements rocheux en forêt thermophile »). This is a critical, not yet typified species and claims of it are in need of critical revision (see also FG).
- *Sonchus asper* (L.) Hill: native plants belong to subsp. *asper*. The very robust subspecies *glaucescens* (Jord.) Ball with large flower heads and bright yellow ligules has recently been observed as a casual grain alien (Ghent port area, 2018; wn.be).

- The generic limits of *Lactuca* L. have considerably changed recently, as a result of molecular phylogenetic studies, although there is still some disagreement. *Mycelis* Cass. is certainly nested in *Cicerbita* Wallr. but the placement of the latter remains controversial: some authors accept it as a separate lineage (e.g. Cichorieae portal at <https://cichorieae.e-taxonomy.net/portal/>) whereas others also include it in a broadly circumscribed genus *Lactuca* (e.g. Wang *et al.* 2013). The latter concept was applied, following e.g. FG (contrary to H24).

- Two alien, probably ephemeral species of *Crepis* L. were recently recorded in the Flora area: *C. bursifolia* L. and *C. nicaeensis* Balb. The former was found in 2016 in Menen as a pavement weed. In 2020 a small population was discovered in Koksijde (Mar.) and its presence there was confirmed in 2021 (wn.be). This species was also observed in a campsite in Zeeland (Mar.) in 2019 (Verloove *et al.* 2020a). Just beyond but near to the Flora limits, it is also known in Tert. par. (it recently established itself in the Paris area) and Champ. (Troyes) (database CBN Paris). *C. nicaeensis* is apparently known from some areas in Lorr. in France (FLORAINE 2013, Vernier 2020: Meuse and Wœvre). Both species might locally naturalize in climatologically suitable areas and habitats in the Flora area.

- *C. sancta* (L.) Bornm.: in NF6, the taxon that occurs in the Flora area was ascribed to subsp. *nemausensis* (Vill.) Babç. It is, however, probably of no taxonomic value (FG).

- The correct name for the species called *C. polymorpha* Pourr. in NF6 is *C. vesicaria* L. subsp. *taraxacifolia* (Thuell.) Thell. ex Schinz et R. Keller (multiple sources).

- Following recent insights, inferred from molecular phylogenetic studies, *Pilosella* Hill was segregated from *Hieracium* L. (see also FG, H24, Stace 2019).

- *Pilosella* requires further investigation in the Flora area. In addition to the widely accepted (macro-) species, rather numerous infraspecific taxa and microspecies have recently been reported. In some parts of the Flora area, the genus has been studied more thoroughly which resulted in the recognition of additional taxa. This applies particularly to the German part of the area (Eifel centr.; see FT) and to northern France (see FG). From Belgium, Ronse & Gottschlich (2017) also reported three new taxa: *P. caespitosa* (Dum.) P.D. Sell et C. West subsp. *colliniforme* (Peter) P.D. Sell & C. West (Brab.), *P. ×fuscoatra* (Nägeli et Peter) Soják [*P. aurantiaca* (L.) F.W. Schultz et Schultz-Bip. × *caespitosa*] (Camp.) and *P. ×stoloniflorum* (Waldst. et Kit.) F.W. Schultz et Schultz-Bip. (*P. aurantiaca* × *officinarum* F.W. Schultz et Schultz-Bip.) (Fl.).

- In NF6, species of *Pilosella* were assigned to two different life forms: herbaceous chamaephytes (for *P. officinarum* F.W. Schultz et Schultz-Bip. and related species) and rosette-bearing hemicyptophytes (for the remaining species). However, there seems to be no difference, as far as life form is concerned, between these species. In accordance with other recent Floras, such as H24, Jäger &

Werner (2005), etc., all are now considered as hemicryptophytes (based on comm. B. Toussaint, 03.2021).

- Binomials (if available) for the numerous hybrids between species of *Pilosella* were removed, since many of these names are of dubious application.

- *Hieracium* L. also requires further investigation in the Flora area. In some parts of it, the genus has been studied more thoroughly which resulted in the recognition of additional taxa. This applies particularly to the German part of the area (Eifel centr.; see FT and below), to northern France (see FG) and to the Dutch part, although H24, like in NF, only marginally treated these ‘microspecies’ (about 100 in number). H24 only recognized sections (roughly corresponding with ‘macrospecies’) since morphological characteristics of these sections are corroborated by molecular data and gene flow appears to be rare among sections. In NF, a more or less hybrid taxonomical scheme has always been applied in which, in addition to macrospecies, a few microspecies are recognized. This taxonomy was maintained, pending further study, but certainly is in need of a thorough revision.

- *H. glaucinum* Jord.: within this species many infraspecific taxa have been described and several of them have been reported from the Flora territory, especially in the eastern part. FT mentions (post 1980): subsp. *cinerascens* (Jord.) Breistr. et Litard. (Eifel centr.), subsp. *conjugatum* (Boreau) O. Bolòs et Vigo (Eifel centr.), subsp. *pallidifrons* (Sudre) O. Bolòs et Vigo (Ard. or.), subsp. *praecox* (Sch. Bip.) O. Bolòs et Vigo (Ard. or.) and subsp. *recensitum* (Boreau) Gottschlich (Eifel. centr.). At least part of the Flemish populations belong to the latter subspecies (Verloove 2001).

- *H. murorum* L.: within this species many infraspecific taxa have been described and several of them have been reported in the Flora territory, especially in the eastern part. FT mentions, after 1980: subsp. *exotericoides* Zahn (Eifel centr.), subsp. *gentile* (Boreau) Sudre (Ard. or.), subsp. *nemorensis* (Jord.) Zahn (Eifel centr.), subsp. *pseudosilvularum* Zahn (Eifel centr.) and subsp. *subnemorensis* (Zahn) Zahn (Eifel centr.).

- *H. lachenalii* C.C. Gmel.: *H. vulgatum* Fries var. *limburgense* Zahn is endemic to Zuid-Limburg (the Netherlands) and was recently raised to (micro-) species rank, *H. limburgense* (Zahn) Haveman (Haveman 2013). Like in similar cases, no further attention was paid to this taxon in NF7.

- *H. amplexicaule* L.: in the populations that are naturalized in the territory of the Flora, the edge of the leaf blade is mainly provided with fine and flexible hairs; such plants belong to *H. pulmonarioides* Vill. [syn.: *H. amplexicaule* L. subsp. *pulmonarioides* (Vill.) Ces.]. In *H. amplexicaule* s.str. the edge of the leaf blade is almost completely covered with glandular hairs (Verloove & Tison 2019).

169. Adoxaceae

- *Viburnum* L.: several additional ornamental species from this genus have recently been recorded as escapes from cultivation: *V. ×rhytidophylloides* Suringar (*V. lan-*

tana L. × *rhytidophyllum* Hemsl.), *V. davidii* Franch. and *V. plicatum* Thunb. (wn.be).

170. Caprifoliaceae

- An additional, ephemeral escape from cultivation has recently been recorded: *Lomelosia stellata* (L.) Raf. (syn.: *Scabiosa stellata* L.) (Heverlee, 2017; wn.be).

- Several additional ornamental species of the genus *Lonicera* L. have recently been recorded as escapes from cultivation: *L. chrysantha* Turcz. ex Ledeb. (a few localities, since 2012), *L. involucrata* (Richardson) Banks ex Spreng. (Assenede, 2014), *L. maackii* (Rupr.) Maxim. (a few localities, since 2015), *L. morrowii* Gray (Bruges, 2010) and *L. ×purpusii* Rehd. (*L. fragrantissima* Lindl. et Paxt. × *standishii* Jacq.) (Meise, since 2006) (wn.be).

- *L. nitida* Wils. and *L. pileata* Oliv.: these Far Eastern ornamental shrubs have naturalized recently and thus were added to the key and a full account is presented. These are very similar species that are sometimes difficult to tell apart. There is a cv ‘Elegant’ (syn.: *L. yunnanensis* Hort. non Franch.) which is intermediate between *L. nitida* and *L. pileata*. According to some authors, *L. nitida* as well as *L. pileata* are very close to *L. ligustrina* Wall. and perhaps best considered as varieties of the latter species (Schulz 2011). *L. nitida* and *L. pileata* seem to hybridize very easily which also suggests a very close relationship (Wilcox 2016, Armitage & Costain 2017).

- *L. japonica* Thunb.: this ornamental liana has become naturalized locally and was thus added to the key and a full account is presented.

- *Dipsacus laciniatus* L. and *D. strigosus* Willd. ex Roem. et Schult.: these ornamental species are increasingly escaping and have locally naturalized. They were added to the key and full accounts are presented.

- An additional species from the genus *Knautia* L. has been recorded as an ephemeral escape from cultivation: *K. macedonica* Griseb. (rather regularly recorded since 2011; wn.be).

- *K. arvensis* (L.) Coulter s.l.: some populations from Lorr. mér. and sept. differ significantly from *K. arvensis* s.str. by the pinkish-purple corollas, the absence of rhizomes, the peduncles with usually numerous glandular hairs and their phenology (flowering slightly earlier, between May and July). These plants were tentatively ascribed to *K. purpurea* (Vill.) Borbás [syn.: *K. timeroyi* Jord. subsp. *collina* (Schübl. et Martens) Breistr.] in NF6. Based on FG, they probably rather belong to *K. timeroyi* s.str. but the issue requires further study. Some populations (e.g. near Nancy) are homogeneous and quite characteristic, while others (e.g. from near Metz) include, in addition to typical individuals, plants more or less intermediate with *K. arvensis*. It should be noted that some authors include all these taxa in a hypervariable *K. arvensis* (e.g. E+M Plantbase).

- Two ornamental species from the genus *Scabiosa* L. have recently been observed as (probably ephemeral) es-

capex from cultivation: *S. lucida* Vill. (a few localities, since 2019; wn.be) and *S. ochroleuca* L. (a few localities, since 2015; wn.be).

- *S. columbaria* L.: the taxonomic value of subsp. *pratensis* (Jord.) Br.-Bl. requires confirmation. According to FG it is of no taxonomic value.

- *Centranthus calcitrapae* (L.) Duf.: a native from the Mediterranean region, this species is expanding towards the north and reached the Flora area in 2016, first in the Lille metropolitan area in France, where it is locally naturalized in abundance in railway yards. It is a therophyte with a pale pink corolla of approx. 2-5 mm across and with pennatipartite leaves (Verloove *et al.* 2019). It was added to the key and a full account is presented.

- *Valeriana officinalis* L.: the taxonomy and nomenclature of this complex remains controversial. The correct name for the species called *V. repens* Host in NF6 is *V. officinalis*. *V. wallrothii* Kreyer is reduced to subspecies rank under *V. officinalis*, subsp. *tenuifolia* (Vahl) Schübl. et Martens, following FG. According to FG, the widely distributed taxon in the Flora area [subsp. *repens* (Host) O. Bolòs et Vigo] is included in subsp. *sambucifolia* (J.C. Mikan ex Pohl) Čelak. (syn.: *V. sambucifolia* J.C. Mikan ex Pohl). A third subspecies, subsp. *officinalis*, a fairly robust, mesophilic plant, without aerial runners, with medium-sized stem leaves with serrated segments, could also be present in the Flora area. The problem requires further study.

- *Valerianella carinata* Loisel.: according to some authors this species is only a morph of *V. locusta* (L.) Laterr. (FG).

- *V. rimoso* Bast.: according to some authors this species is only a morph of *V. dentata* (L.) Pollich (FG).

171. Araliaceae

- *Hedera helix* L.: two subspecies that were distinguished in NF6, subsp. *helix* and subsp. *hibernica* (Kirchn.) McClintock, are now treated as two distinct species, *H. helix* s.str. and *H. hibernica* (Kirchn.) Bean respectively. According to McAllister & Rutherford (1997) they are cytologically and morphologically distinct and have a different geographical distribution. All recent authors therefore accept both as separate species (see also Valcárcel & Vargas 2010).

- *Hedera* L. remains poorly understood in the Flora area. In addition to the aforementioned species and *H. colchica* (K. Koch) K. Koch, all already cited in NF6, at least one further species has recently been recorded as an escape from cultivation, *H. maroccana* McAllister (Lummen, 2010; wn.be).

- Three alien species of *Hydrocotyle* L. are currently known in the Flora area. In addition to the invasive aquatic weed *H. ranunculoides* L. f., two further species were recently reported by Verloove & Heyneman (2021): *H. sibthorpioides* Lam. and *H. verticillata* Thunb. (Bredene, since 2009). The former species has been known since the 1980s as a weed from the Antwerp Zoo but was initially

erroneously ascribed (also in NF6) to *H. novae-zelandiae* DC. It was recently also discovered as a lawn weed in Knokke in Mar. and in Maarheeze in Camp. (the Netherlands).

172. Apiaceae

- Recent molecular phylogenetic studies have called into question the delimitation of certain genera of this family. A new generic classification therefore has been adopted (see below for details).

- Three additional ephemeral alien species were added: *Cyclospermum leptophyllum* (Pers.) Sprague ex Britton et P. Wilson [syn.: *Apium leptophyllum* (Pers.) F. Muell.] (Antwerp port area, 2015-16; wn.be), *Opopanax chironium* Koch (Herent, 2019-22; wn.be) and *Trachyspermum ammi* (L.) Sprague ex Turrill (Meerts 1985).

- An additional ephemeral alien species of *Eryngium* L. was recently recorded, *E. bourgatii* Gouan (Kleine Brogel, 2013; wn.be).

- *Chaerophyllum hirsutum* L.: this species, previously unknown in the Flora area, is indicated in Lorr. (including Woëvre, and thus within the Flora area) from several locations by both FLORAINE (2013) and Vernier (2020). FG, on the contrary, does not report this species for northeastern France. These claims require confirmation and were not taken into account (based on comm. S. Antoine May 2021).

- An additional alien (ephemeral) species of *Scandix* L. was recently recorded, *S. stellata* Banks et Sol. (comm. S. Carbonnelle).

- The ephemeral alien *Torilis arvensis* (Huds.) Link subsp. *purpurea* (Ten.) Hayek is now accepted as a distinct species by most contemporary authors, *T. africana* Spreng. (Reduron 2007-2008).

- *T. arvensis* (Huds.) Link: the usual taxon in the Flora area is subsp. *arvensis* (*T. arvensis* s.str.). In FT, these plants (which are not rare in the Moselle valley but mostly outside the Flora area) are ascribed to subsp. *recta* Jury, a synonym of subsp. *arvensis* according to FG although not all authors agree on this. Perhaps the identity of plants in the eastern part of the Flora area needs to be reassessed.

- The correct name for the species named *Orlaya platycarpus* Koch in NF6 is *O. daucooides* (L.) Greuter.

- An additional, ephemeral alien species of *Bupleurum* L. was recently recorded, *B. odontites* L. (Antwerp port area, 2015; comm. D. De Beer).

- The generic limits of *Apium* L. have changed as a result of molecular phylogenetic studies (e.g. Ronse *et al.* 2010). In the Flora area, in a strict sense, it only accommodates *A. graveolens* L., the three other native species having been transferred (again) to *Helosciadium* Koch: *H. inundatum* (L.) Koch, *H. nodiflorum* (L.) Koch and *H. repens* (Jacq.) Koch.

- *H. nodiflorum* (L.) Koch: this species is polymorphic and two varieties were distinguished in NF6. However,

these varieties hardly represent more than local accommodations, resulting for instance from trampling. This applies to var. *ochreatum* (DC.) DC., a slender plant with stems rooting at all nodes, with narrower lower leaf segments and pedunculate umbels. It is doubtlessly of limited taxonomic value but nonetheless worth mentioning because this morph resembles *H. repens*, from which it is distinguished by the involucre with 0-2 (-3) bracts, the size of the fruit and the peduncle of the umbel rarely being longer than the rays.

- *Sison amomum* L.: in NF6, the height of this species was said to be 30-50 cm. It is, however, most of the time much taller, up to 200 cm (pers. obs. author; see also FG, wn.be).
- The generic limits of *Ammi* L. have changed. *Ammi visnaga* (L.) Lam. was transferred to the segregate genus *Visnaga* Mill. (as *V. daucooides* Gaertn.) (e.g. Reduron 2007-2008). Molecular data previously suggested a close relationship of the latter to the morphologically very different genus *Smyrniopsis* Boiss. (Downie *et al.* 2010).
- As a result of recent molecular phylogenetic studies *Carum* L. was re-circumscribed (Zakharova *et al.* 2012). The rare native species *Carum verticillatum* L., which was shown to be sister to the Oenantheae clade, is now accommodated in the monotypic genus *Trocdaris* Raf., as *T. verticillatum* (L.) Raf.
- The generic limits of *Seseli* L. are not entirely resolved yet. *S. libanotis* (L.) Koch was transferred to the segregate genus *Libanotis* Zinn in some recent western European Flora accounts (e.g. FG). However, recent molecular studies seem to indicate that it may not be acceptable as a separate genus (Lyskov *et al.* 2018). A conservative approach was thus applied in NF7.
- *Aethusa cynapium* L.: the three varieties that were distinguished in NF6 are probably of variable taxonomic value. Var. *agrestis* Wallr. is likely a mere post-cultural morphosis (and thus of no taxonomic value whatsoever) while var. *gigantea* Lej. might in fact deserve a higher rank (FG, Reduron 2007-2008).
- *Angelica sylvestris* L. subsp. *bernardae* Reduron: this taxon was mentioned in NF6 from Haute Ard. However, the genuine identity of plants with wider than usual leaf segments needs to be re-assessed. In France, subsp. *bernardae* is confined to mountainous regions and does not occur below 1200 m (FG). Its presence in the Flora area thus seems quite unlikely.
- *A. archangelica* L. subsp. *litoralis* (Fries) Thell.: the assumption, already put forward in NF6, that claims of this taxon in the Flora area (Mar. mér.) are erroneous, was recently confirmed by FG. On the other hand, according to H24, cultivated plants (and potentially thus also those occurring as escapes) are intermediate between subsp. *litoralis* and subsp. *archangelica*. This issue requires further study.
- The generic limits of *Peucedanum* L. have dramatically changed as a result of recent molecular phylogenetic stud-

ies. The six species treated in NF6 are now accommodated in six different genera: *Peucedanum* s.str. (*P. gallicum* Latourr.), *Imperatoria* L. (*I. ostruthium* L.), *Thysselinum* Adans. [*T. palustre* (L.) Hoffmann], *Dichoropetalum* Fenzl [*D. carvifolia* (Vill.) Pimenov et Kljuykov], *Oreoselinum* Mill. (*O. nigrum* Delarbre) and *Cervaria* Wolf (*C. rivini* Gaertn.) (e.g. Spalik *et al.* 2004, Winter *et al.* 2008). These new insights were also followed in other contemporary western European Floras (FG, H24, Stace 2019). *Peucedanum* s.l., however, remains a very critical assemblage and the segregation of these genera on the basis of morphological, karyological and molecular data is rarely supported by other characters (Pimenov *et al.* 2016).

- *Pastinaca sativa* L. subsp. *sativa* var. *sativa*: in NF6, this variety was said to have leaves with an indumentum composed of sparse, short hairs. In reality, this taxon is more often merely glabrous (see also FG).
- An alien, ephemeral species of *Heracleum* L. was recently observed: *H. sibiricum* L. [syn.: *H. sphondylium* L. subsp. *sibiricum* (L.) Simonk.] (Ghent port area, 2017; wn.be).
- The possible existence of putative hybrids between *H. mantegazzianum* Somm. et Lev. and *H. sphondylium*, previously confused with *H. laciniatum* Hornem., was already mentioned in NF6. Such plants have recently been reported several times from Ard. in the Grand-Duchy of Luxembourg (Krippel & Colling 2016, Krippel *et al.* 2018, 2020). These plants, at first glance, resemble very vigorous specimens of *H. sphondylium* but, after closer examination, show certain characteristics typical of *H. mantegazzianum* or intermediate characteristics: shape and cutting of the leaf, hairiness, spots on the stem and especially the smell that strongly reminds of that of the latter species (comm. Y. Krippel, June 2021). Given the complexity of this species group, molecular techniques will be required to elucidate this issue.
- *Daucus carota* L.: recent studies have confirmed that the subspecies of this species are interfertile and thus probably of little taxonomic value (Arbizu *et al.* 2014, Spooner *et al.* 2014; see also FG).
- The non-native genus *Smyrniium* L., with two species in the Flora area, is increasingly observed and locally tends to naturalized, especially *S. perfoliatum* L. It was introduced to the key and a full account is presented. A second species, *S. olusatrum* L., is a more recent introduction and might also naturalize locally in the near future. Characteristics useful for its identification were also added.

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